United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
University of Nebraska,
Conservation and Survey
Division

Soil Survey of Sherman County, Nebraska

How To Use This Soil Survey

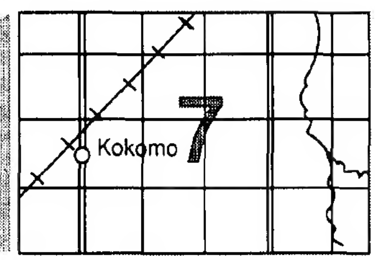
General Soil Map

The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

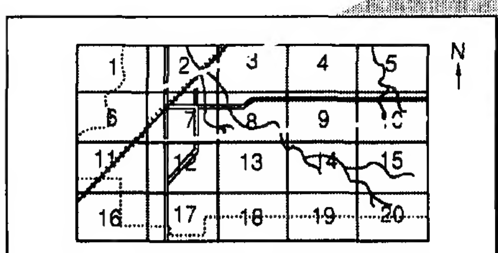
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.



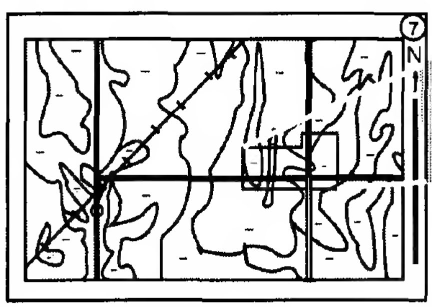
MAP SHEET

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



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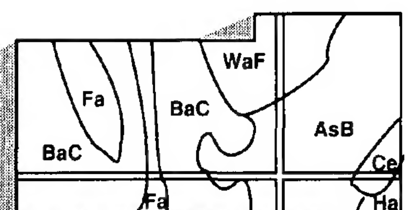

AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the University of Nebraska, Conservation and Survey Division. It is part of the technical assistance furnished to the Lower Loup Natural Resources District. This District accelerated completion of the survey by providing financial assistance to employ a soil scientist. The District, the Sherman County Supervisors, and the Old West Regional Commission provided financial assistance to fund aerial photography.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A typical area in the valley of the Middle Loup River. The Uly-Coly-Holdrege association is in the background.

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Issued May 1990

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Foreword

This soil survey contains information that can be used in land-planning programs in Sherman County, Nebraska. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are moderately deep over bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

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State Conservationist
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Soil Survey of Sherman County, Nebraska

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United States Department of Agriculture, Soil Conservation Service,
in cooperation with
University of Nebraska, Conservation and Survey Division

SHERMAN COUNTY is in the central part of Nebraska (fig. 1). It has a total area of about 366,080 acres, or 576 square miles. It is 24 miles square. It is bordered on the north by Valley and Greeley Counties, on the east by Howard County, on the south by Buffalo County, and on the west by Custer County.

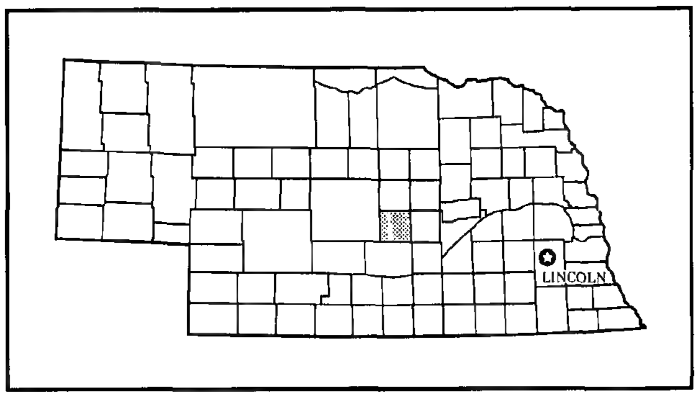

Figure 1.—Location of Sherman County in Nebraska.

Farming is the main source of income in Sherman County. About 38 percent of the land area is cropland, and about half of the cropland is irrigated. About 58 percent of the land area is rangeland. About 4 percent is areas of towns, roads, and structures. Most farms are a combination of cash-grain and livestock enterprises. On most farms raising beef cattle is important. A few ranches are in the county. Most of the farms have some hogs. A few have dairy herds, and a few have some sheep.

Wheat and grain sorghum are the main dryland crops. Corn, soybeans, and alfalfa are the main irrigated crops. The extent of center-pivot sprinkler irrigation has increased in the strongly sloping areas. Water erosion is a severe hazard on gently sloping to moderately steep cropland. The wetness caused by a fluctuating seasonal high water table is a limitation on the bottom land along the Middle Loup River. Managing irrigation water and maintaining or improving the quality of the underground water supply are important management concerns.

The population of Sherman County was 4,230 in 1980. Loup City, the largest town and the county seat, has a population of about 1,370. Other towns in the county are Ashton, Hazard, Litchfield, and Rockville.

The transportation facilities in Sherman County generally are adequate. A main line of a railroad extends across the southwestern part of the county through the towns of Hazard and Litchfield. This is the only railroad in the county. In Ashton, Rockville, and Loup City, no rail service is available. Several hard-surfaced state highways cross the county, and all towns have at least one all-weather road. State Highways 10, 58, and 92 intersect at Loup City. They provide access to markets and supplies in Grand Island and Kearney and to Interstate 80. Many county roads have gravel surfaces, and a few are hard surfaced. The roads are mostly on section lines, but many section lines do not have roads. A small airport near Loup City provides ground maintenance for small aircraft.

This survey updates the survey of Sherman County

published in 1931 *(3)*. It gives additional information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides general information about the history and development, climate, geology and ground water, and physiography, relief, and drainage of Sherman County.

History and Development

Before the county was organized, hunters and trappers came to the survey area in search of deer, elk, buffalo, and furbearers. The early settlers built their first homes out of sod and timber along the spring-fed creeks. In these areas they also found plenty of game. The first permanent settlement was Loup City in 1871.

In 1873, Sherman County was organized *(5)*. Loup City was established as the county seat, and school districts were formed. The settlers acquired land through the Homestead Act of 1862 and the Timber Culture Act of 1873. Other settlers purchased land from the railroads, to which the federal government had given land to extend their systems and to help settle the West. Large numbers of settlers arrived in the late 1870's. A railroad to Loup City was built in 1886. By 1890, most of the county was settled.

Most early settlers engaged in cattle ranching, and many started ranches. In the 1860's, cattle grazed open range. Sheep were raised on a few ranches. As the population increased and as the railroad expanded into the area, farming changed from ranching to a combination of cash-grain and livestock farms.

Prior to the use of irrigation systems, insufficient rainfall in summer generally reduced dryland crop yields. Consequently, in the 1880's, irrigation with water from the Middle Loup River was begun. Irrigation canals were planned, but the original plan was later discarded. The Sherman County Irrigation, Water Power, and Improvement Company was organized in 1894. A canal was constructed, used for a few seasons, and then abandoned.

The drought of the 1930's revived interest in irrigation canals. As a result, the Middle Loup Power and Irrigation Project was organized. Construction of canals began in 1936, and water was delivered to leveled fields by 1938. The canals are constructed along the foot slopes on both sides of the valley of the Middle Loup River. They deliver water to crops on the bottom land and stream terraces.

Sherman Reservoir, about 5 miles northeast of Loup City, is the most important water-storage facility in the county. It supplies water for irrigation in the eastern part of Sherman County and a large area of cropland in Howard County. The lake is formed by a 4,500-foot earth-filled dam across the valley of Oak Creek. The surface area at normal water level is about 2,840 acres. The Bureau of Reclamation completed preconstruction investigations for the dam in 1948. Construction of the dam was completed in 1963. The Loup Basin Reclamation District and the Farwell Irrigation District were organized in 1950.

Water for the Sherman Reservoir is diverted from the Middle Loup River by the Arcadia diversion dam south of Comstock, in Custer County. It is transported to the reservoir through the 19-mile-long Sherman Reservoir Feeder Canal. The canal features a tunnel, 2,000 feet long and 11.5 feet in diameter, through the divide between the valleys of the Middle Loup River and Oak Creek.

Irrigation water is released from the Sherman Reservoir into the Farwell Main and Farwell South Canals. About 80 percent of the cropland irrigated with water from these canals is in Howard County. In Sherman County the water is carried through irrigation laterals to fields on the stream terraces and bottom land along Oak Creek. The tablelands on the divide between Deer Creek and Oak Creek are irrigated with water from the Farwell South Canal. The Deer Station pumping plant lifts the water to the laterals on the divide.

Deep wells can supply adequate quantities of water for irrigation in most areas of the county. Most wells yield about 700 to more than 1,100 gallons per minute. Center-pivot sprinkler systems gained popularity during the 1970's and early 1980's. These systems are used to irrigate the strongly sloping and moderately steep slopes. A conservation tillage system and other special conservation practices help to control water erosion and to sustain crop production in these areas. In most years a permanent plant cover is needed to control water erosion on the steep slopes. In 1985, the county had 511 irrigation wells and 330 center-pivot irrigation systems.

Climate

Prepared by the National Climatic Data Center, Asheville, North Carolina.

In Sherman County winters are cold because of incursions of cold, continental air that bring fairly frequent spells of low temperatures. Summers are hot

but are occasionally interrupted by cooler air from the north. Snowfall is fairly frequent in winter, but the snow cover is usually not continuous. Rainfall is heaviest in late spring and early summer. Annual precipitation is normally adequate for wheat, sorghum, and range grasses.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Loup City, Nebraska, in the period 1951 to 1981. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 13 degrees. The lowest temperature on record, which occurred at Loup City on January 27, 1963, is -32 degrees. In summer the average temperature is 73 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Loup City on July 11, 1954, is 112 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 24 inches. Of this, nearly 18 inches, or about 45 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 15 inches. The heaviest 1-day rainfall during the period of record was 5.05 inches at Loup City on June 17, 1954. Thunderstorms occur on about 49 days each year. Tornadoes and severe thunderstorms, some of which are accompanied by hail, occur occasionally. These storms are local in extent and of short duration. They cause variable damage in scattered small areas.

The average seasonal snowfall is about 31 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 24 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 60 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 14 miles per hour, in spring.

Geology and Ground Water

Pierre Shale underlies Sherman County. It is black to bluish gray marine shale deposited during the Upper Cretaceous Period. Its thickness in the county ranges from about 150 to 400 feet.

The Ogallala Group of Tertiary (Miocene) age overlies the Pierre Shale throughout the county. It is the youngest bedrock in the county. It consists of sand- and lime-cemented sandstone, sand, gravel, and silt *(4)*. The only exposure of the Ogallala Group in the county is in a bluff near the town of Rockville.

Pleistocene-age deposits of sand and gravel, silt, and clay overlie the Ogallala Group. Wind-deposited silt (loess) of Recent age overlies the Pleistocene deposits in nearly all the uplands and on the terraces along the major streams. A small area near the southeast corner of the county is mantled by wind-deposited sand. In the valley of the Middle Loup River, the alluvial deposits on the stream terraces and bottom land consist mostly of sand. In the valleys of Mud Creek and smaller streams, however, they consist mostly of silt.

Where the Ogallala Formation and overlying unconsolidated deposits are saturated, they are tapped by wells, which supply water for irrigation and domestic use. Generally because of calcium bicarbonate, the water is rated hard. Drainage from feedlots, septic tanks, and other waste disposal areas can contaminate ground water.

The Middle Loup River flows southeasterly across Sherman County. Its flow consists mostly of ground water from the large sandhills in which it originates. Ground water discharge and overland runoff increase its flow within the county. The river is the source of nearly all the surface water used for irrigation in Sherman County.

Physiography, Relief, and Drainage

Sherman County is in the Great Plains physiographic province. The county is part of a loess-covered plain that once made up most of the eastern and central parts of Nebraska. About 79 percent of the county consists of gently sloping to very steep, loess-covered uplands. The broad valley of the Middle Loup River extends diagonally across the county from northwest to southeast. Oak Creek, Mud Creek, and Clear Creek flow to the southeast.

Tributaries of these streams dissect nearly all the uplands. As a result, the topography is generally rolling and hilly. The divides between the upland drainageways are commonly narrow and rounded. Small, irregularly shaped, nearly level and very gently sloping tablelands are on the wider parts of the divides. The tablelands mark the level of the original loess plain. The largest of these is in the southeastern part of the county.

Side slopes along the upland drainageways range from long and gradual to short and steep. Drainageways are commonly narrow and V-shaped near their source and become wider and have gradual side slopes downstream. In places the drainageways have entrenched deeply into the loess, forming valleys with very steep side slopes. Scattered areas of this rough, broken relief are throughout the uplands. The soils in these areas are well drained to excessively drained and formed in loess.

About 19 percent of the county occurs as areas of alluvium and colluvium on stream terraces and bottom land. The soils on the bottom land along the Middle Loup River formed mostly in sandy alluvium. In some areas loamy alluvium is deposited over the sandy material. The soils in these areas have a seasonal high water table. The soils near the river are somewhat poorly drained to very poorly drained and are occasionally or frequently flooded. The soils on the higher bottom land are mostly moderately well drained or somewhat poorly drained and are subject to rare flooding. Those on the stream terraces in the valley of the Middle Loup River are mainly loamy and silty, alluvial soils. The terraces are 5 to 20 feet above the bottom land. A few areas consist of wind-deposited sand. The soils on stream terraces are well drained or somewhat excessively drained.

The soils on the bottom land and stream terraces along Oak Creek, Mud Creek, and Clear Creek formed mostly in silty alluvium. They are occasionally or frequently flooded. The creeks in these areas are spring fed.

One area of wind-deposited sand is in the southeast corner of the county. Another long, narrow area is on the divide between Rock Creek and the Middle Loup River. These areas consist of dunes 20 to 30 feet high and are part of the sandhills. The soils in these areas are moderately well drained to excessively drained and are sandy and loamy.

U.S. Geological Survey maps show that the elevations in the county range from 2,400 feet above sea level on the uplands in the northwestern part of the county to 1,930 feet on the bottom land along the Middle Loup River near the Howard County line. The county has an average elevation of about 2,200 feet and generally slopes to the southeast. The elevation is 2,165 feet at Litchfield, 2,109 feet at Hazard, 2,091 feet at Loup City, 1,980 feet at Rockville, and 2,038 feet at Ashton.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils.

After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Differences are the result of changes and refinements in series concepts, different slope groupings, and the application of the latest classification system.

Soil Descriptions

1. Uly-Coly-Holdrege Association

Deep, very gently sloping to very steep, well drained to excessively drained, silty soils; on uplands

This association consists of soils on rounded ridgetops and side slopes along upland drainageways. The soils formed in loess (fig. 2).

This association makes up 285,900 acres, or about 78 percent of the county. It is about 41 percent Uly soils, 39 percent Coly soils, 9 percent Holdrege soils, and 11 percent minor soils.

Uly soils are gently sloping to moderately steep and are on divides and long, smooth side slopes along upland drainageways. They are well drained and somewhat excessively drained. Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The subsoil is friable silt loam about 9 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Coly soils are strongly sloping to very steep and are on narrow, rounded ridgetops and side slopes along upland drainageways. They are well drained to excessively drained. Typically, the surface layer is grayish brown, very friable silt loam about 5 inches thick. The transition layer is light brownish gray, very friable, calcareous silt loam about 5 inches thick. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Holdrege soils are very gently sloping and gently sloping and are on tablelands and smooth divides. They are well drained. Typically, the surface soil is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 20 inches thick. The upper part is dark grayish brown and grayish brown, firm silty clay loam, and the lower part is light brownish gray, friable silt loam. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam.

Minor in this association are Hall, Hobbs, Hord, and Scott soils. Hall soils are slightly lower on the landscape than Holdredge soils. Also, they have a thicker surface soil. Hobbs soils are on bottom land along upland drainageways. They are stratified. Hord soils are on stream terraces. They have a surface soil that is thicker than that of the major soils. Scott soils are in depressions that are ponded for much of the growing season. They contain more clay in the subsoil than the major soils.

Farms in this association are diversified, mainly a combination of cash-grain and livestock enterprises. The very gently sloping to strongly sloping areas are used mostly for cultivated crops. A large part of the cropland is irrigated. The main dryland crops are wheat, grain sorghum, and alfalfa. The main irrigated crops are corn, alfalfa, and soybeans. The steep and very steep

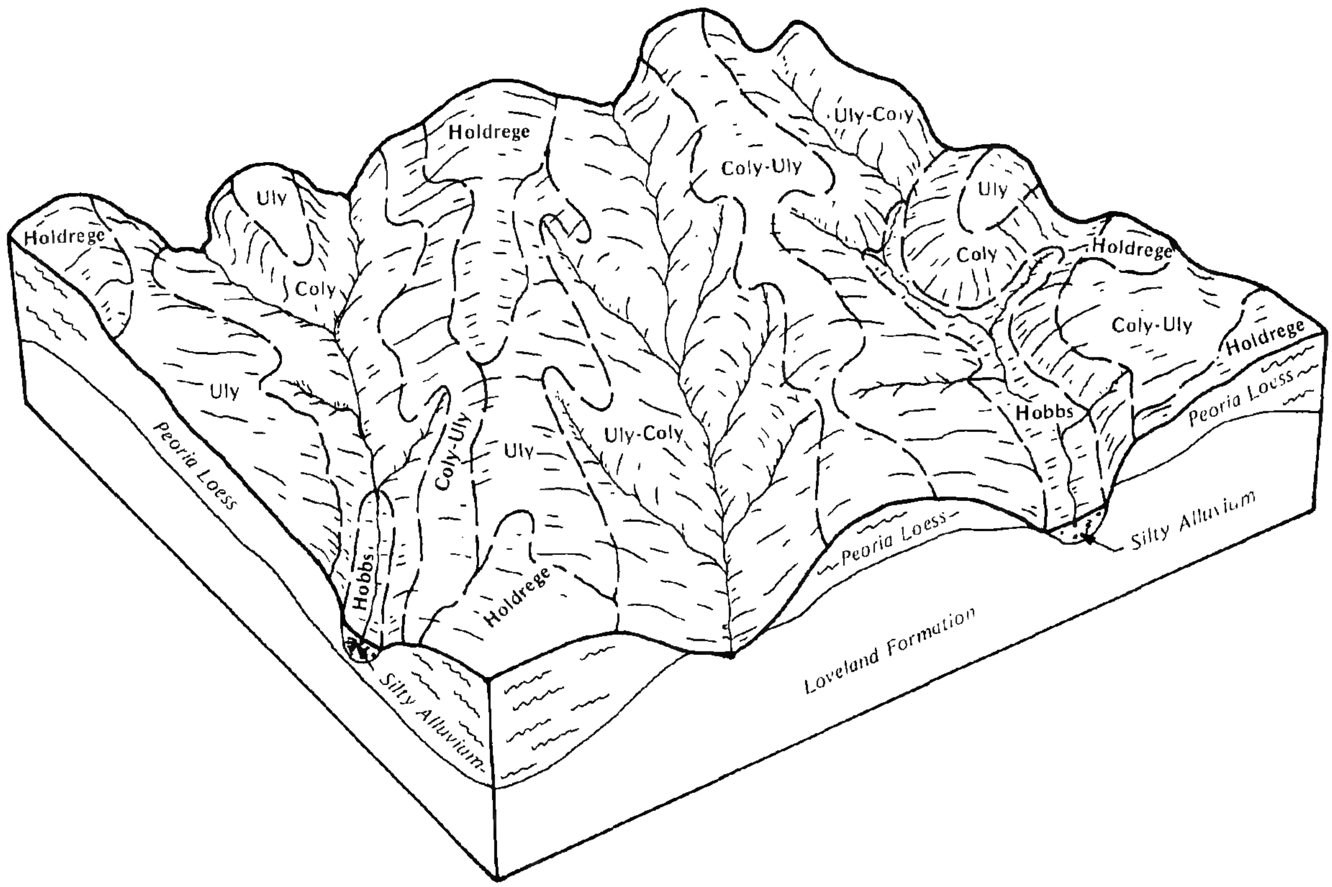

Figure 2.—Typical pattern of soils and parent material in the Uly-Coly-Holdrege association.

slopes along drainageways support native grasses and are used for grazing.

Water erosion is a severe hazard. In dryfarmed areas insufficient rainfall for crops is a limitation. In irrigated areas managing irrigation water and controlling erosion are management concerns. Range management that includes proper grazing use, timely deferment of grazing, and a planned grazing system helps to maintain or improve the range condition.

2. Holdrege-Uly-Coly Association

Deep, nearly level to steep, well drained and somewhat excessively drained, silty soils; on uplands

This association consists of soils on irregularly shaped tableland and side slopes along upland drainageways. The soils formed in loess.

This association makes up 3,730 acres, or about 1 percent of the county. It is about 70 percent Holdrege soils, 14 percent Uly soils, 10 percent Coly soils, and 6 percent minor soils.

Holdrege soils are nearly level to gently sloping and are on broad, smooth ridgetops and tableland. They are well drained. Typically, the surface soil is dark grayish brown, friable silt loam about 12 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown and grayish brown, firm silty clay loam in the upper part and light brownish gray, friable silt loam in the lower part. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam.

Uly soils are strongly sloping and moderately steep. They are on side slopes and divides. They are well drained and somewhat excessively drained. Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The subsoil is friable silt loam about 9 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of more than 60 inches is

light gray, calcareous silt loam.

Coly soils are strongly sloping to steep and are on side slopes along upland drainageways. They are somewhat excessively drained. Typically, the surface layer is grayish brown, very friable silt loam about 5 inches thick. The transition layer is light brownish gray, very friable, calcareous silt loam about 5 inches thick. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Minor in this association are Hall and Hobbs soils. Hall soils are lower on the landscape than Holdrege soils. Also, they have a thicker surface soil. Hobbs soils are on bottom land along drainageways and are stratified.

Farms in this association are diversified, mostly a combination of cash-grain and livestock enterprises. Most of the very gently sloping and gently sloping areas are farmed. Many of these areas are gravity irrigated. Center-pivot systems are used to irrigate the gently sloping and strongly sloping areas. Corn, alfalfa, and soybeans are the main crops. The soils on the steeper side slopes along upland drainageways support native grasses and are used for grazing.

Water erosion is a hazard. In dryfarmed areas insufficient rainfall during the growing season is a limitation. In irrigated areas managing irrigation water and controlling erosion are management concerns. Range management that includes proper grazing use, timely deferment of grazing, and a planned grazing system helps to maintain or improve the range condition.

3. Hord-Hobbs Association

Deep, nearly level and very gently sloping, well drained, silty soils; on bottom land and stream terraces

This association consists of soils on bottom land and stream terraces along the major creeks. The soils formed in silty alluvium (fig. 3).

This association makes up about 20,700 acres, or about 6 percent of the county. It is about 45 percent Hord soils, 43 percent Hobbs soils, and 12 percent minor soils.

Hord soils are nearly level and very gently sloping. They are on stream terraces. They are slightly higher on the landscape than Hobbs soils. Typically, the surface soil is dark grayish brown, friable silt loam about 16 inches thick. The subsoil is friable silt loam about 20 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of more than 60 inches is pale brown silt loam.

Hobbs soils are nearly level and very gently sloping and are on bottom land. Some areas are occasionally or frequently flooded for short periods. Typically, the surface layer is dark grayish brown, very friable silt loam about 7 inches thick. The underlying material to a depth of more than 60 inches is stratified dark grayish brown and grayish brown silt loam.

Minor in this association are Coly, Cozad, Hall, and Uly soils. Coly and Uly soils formed in loess on uplands. Cozad and Hall soils are in landscape positions similar to those of Hord soils. Cozad soils have a surface soil that is thinner than that of Hord and Hobbs soils. Hall soils contain more clay in the subsoil than Hord and Hobbs soils.

Farms in this association are mainly a combination of cash-grain and livestock enterprises. Most of the farms extend into adjacent associations in the dissected loess uplands. The soils in the association are used mostly as cropland. A large acreage is irrigated. Irrigation water is supplied by deep wells. Corn is both the main dryland and the main irrigated crop. Small acreages are used for alfalfa, soybeans, grain sorghum, and wheat.

Meandering, entrenched channels commonly dissect the areas of Hobbs soils that are frequently flooded. These areas support native grasses and are used for grazing. Brush and trees are common along the channels. They provide good habitat for upland and rangeland wildlife.

Flooding is the main hazard in this association. Erosion-control dams in combination with diversions, terraces, grassed waterways, contour farming, and conservation tillage on the adjacent uplands help to control runoff and flooding.

4. Loup-Bolent-Barney Association

Deep, nearly level, very poorly drained to somewhat poorly drained, loamy and sandy soils; on bottom land

This association consists of soils on bottom land along the Middle Loup River. The soils formed in loamy and sandy alluvium (fig. 4).

This association makes up 14,100 acres, or about 4 percent of the county. It is about 40 percent Loup soils, 15 percent Bolent soils, 14 percent Barney soils, and 31 percent minor soils.

Loup soils are poorly drained and very poorly drained. They are on low flats and in oxbows and old river channels on bottom land. They are slightly higher on the landscape than Barney soils. Typically, the surface soil is dark gray and very dark gray, very friable fine sandy loam or loam about 10 inches thick. The underlying material to a depth of more than 60 inches is

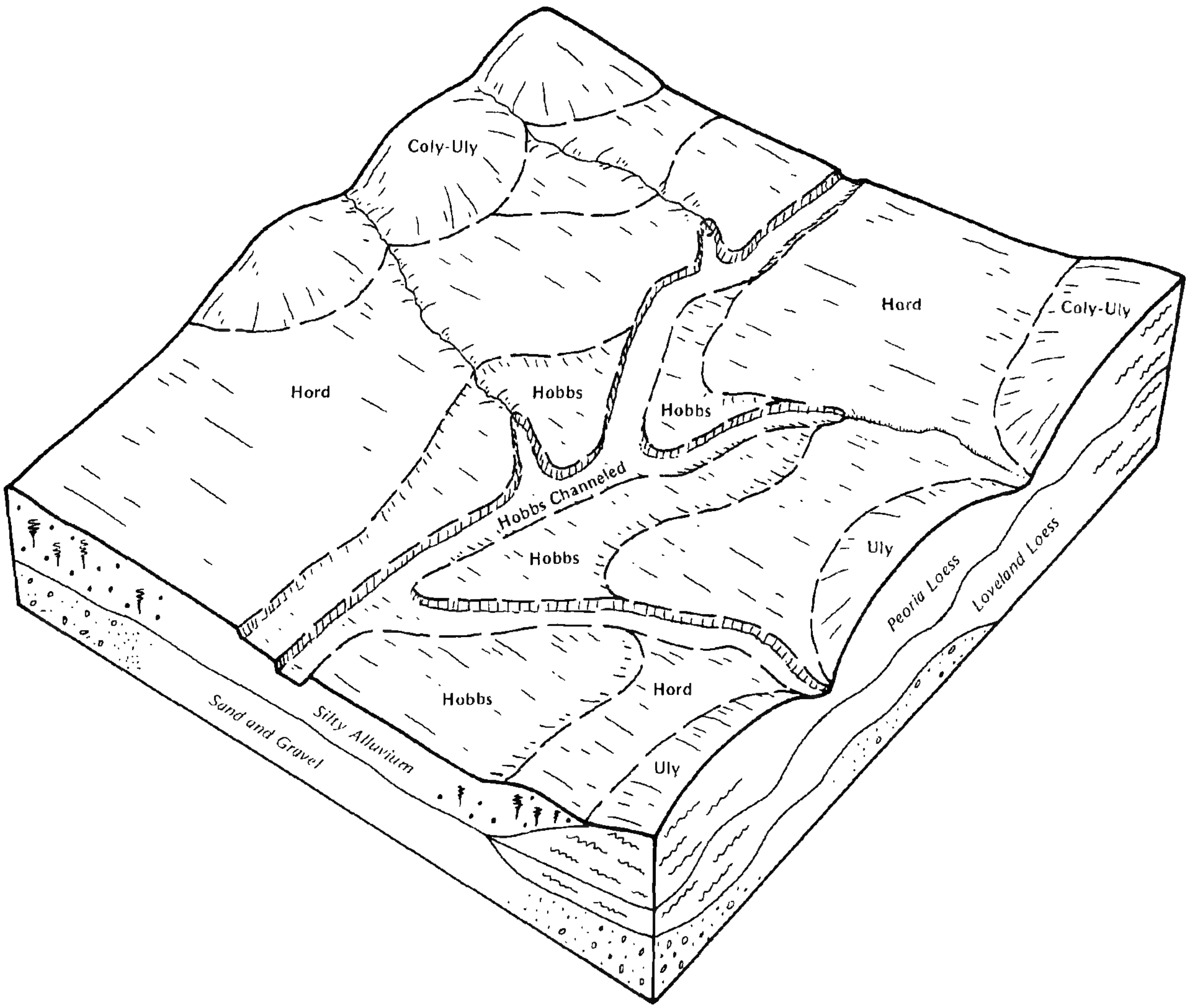

Figure 3.—Typical pattern of soils and parent material in the Hord-Hobbs association.

light gray and white, mottled fine sand.

Bolent soils are somewhat poorly drained and are mainly on bottom land along the Middle Loup River. They are higher on the landscape than Barney soils. Typically, the surface layer is dark grayish brown, very friable loamy sand about 7 inches thick. The transition layer is light brownish gray, mottled, loose, calcareous fine sand about 5 inches thick. The underlying material to a depth of more than 60 inches is light gray and light brownish gray, mottled fine sand.

Barney soils are very poorly drained and are on bottom land along the Middle Loup River. They are frequently flooded. The vegetation consists mostly of trees and brush interspersed with areas of native grasses and wetland plants that livestock can graze during dry periods. The plant cover provides good habitat for wildlife. Typically, the surface layer is dark gray, mottled, calcareous, very friable loam about 8 inches thick. The underlying material to a depth of more than 60 inches is light gray, mottled, stratified fine sand and sand.

Minor in this association are Boel soils and

Fluvaquents. Boel soils are in landscape positions similar to those of Bolent soils. Their surface soil is thicker than that of the Bolent soils. Fluvaquents are lower on the landscape than Barney soils and are ponded for longer periods. Also of minor extent are the river channel and water areas.

Farms in this association extend into the adjacent associations. Most areas support native grasses and are used for hay and grazing. A few areas are suitable only for use as wildlife habitat. A few are used for irrigated crops, mainly corn and alfalfa. In wet years the seasonal high water table damages alfalfa stands. If suitable outlets are available, open or tile drainage systems can be installed to lower the water table.

5. Ipage-Valentine-Libory Association

Deep, nearly level to moderately steep, moderately well drained and excessively drained, sandy soils; on stream terraces and uplands

This association consists of soils on stream terraces and uplands along the Middle Loup River. The soils formed in sandy eolian material and silty or sandy alluvium.

This association makes up about 8,650 acres, or about 2 percent of the county. It is about 32 percent Ipage soils, 19 percent Valentine soils, 14 percent Libory soils, and 35 percent minor soils.

Ipage soils are nearly level and very gently sloping. They are in swales and small valleys on stream terraces. They are moderately well drained. Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 6 inches thick. The transition layer is grayish brown, very friable loamy fine sand about 6 inches thick. The underlying material to a depth of 60 inches is fine sand. The upper part is very pale brown, and the lower part is light gray, very pale brown, and white and is mottled.

Valentine soils are gently sloping to moderately steep and are on hummocky ridges and dunes. They are excessively drained. Typically, the surface layer is grayish brown, loose fine sand or loamy fine sand about 8 inches thick. The transition layer is brown, loose fine sand about 5 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sand.

Libory soils are nearly level and very gently sloping and are on stream terraces. They are moderately well drained. Typically, the surface soil is grayish brown and dark grayish brown, very friable loamy fine sand about 14 inches thick. The subsoil is about 31 inches thick. It is light brownish gray and light gray, mottled, loose fine sand in the upper part and grayish brown, mottled, firm silty clay loam in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Minor in this association are Anselmo, Boelus, Cozad, and Hersh soils. Anselmo and Hersh soils are on uplands. They contain less sand than Valentine soils. Boelus and Cozad soils are on stream terraces. Boelus soils are well drained. Cozad soils are silty.

Farms in this association are a combination of cash-grain and livestock enterprises. Some areas are used for irrigated crops, mainly corn and alfalfa.

Controlling soil blowing and, in irrigated areas, efficiently using irrigation water are management concerns. A planned grazing system that includes proper grazing use and timely deferment of grazing or haying helps to maintain or improve the range condition.

6. Valentine-Hersh Association

Deep, gently sloping to moderately steep, excessively drained and well drained, sandy and loamy soils; on uplands and stream terraces

This association consists of undulating to rolling soils on sandhills interspersed with small, enclosed valleys. The soils formed in sandy and loamy eolian material.

This association makes up 9,100 acres, or about 3 percent of the county. It is about 55 percent Valentine soils, 27 percent Hersh soils, and 18 percent minor soils.

Valentine soils are gently sloping to moderately steep. They are mostly on hummocks, hills, and dunes. They are excessively drained. Typically, the surface layer is grayish brown, loose fine sand or loamy fine sand about 8 inches thick. The transition layer is brown, loose fine sand about 5 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sand.

Hersh soils are gently sloping and are on stream terraces and in hummocky areas and swales between areas of sandhills and the silty tableland. They are well drained. Typically, the surface layer is light brownish gray, very friable fine sandy loam about 8 inches thick. The transition layer is brown, very friable very fine sandy loam about 6 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sandy loam.

Minor in this association are Anselmo, Boelus, and Ipage soils. Anselmo and Ipage soils are lower on the landscape than the major soils. Also, Anselmo soils have a thicker surface layer. Ipage soils are moderately well drained. Boelus soils are on stream terraces. They

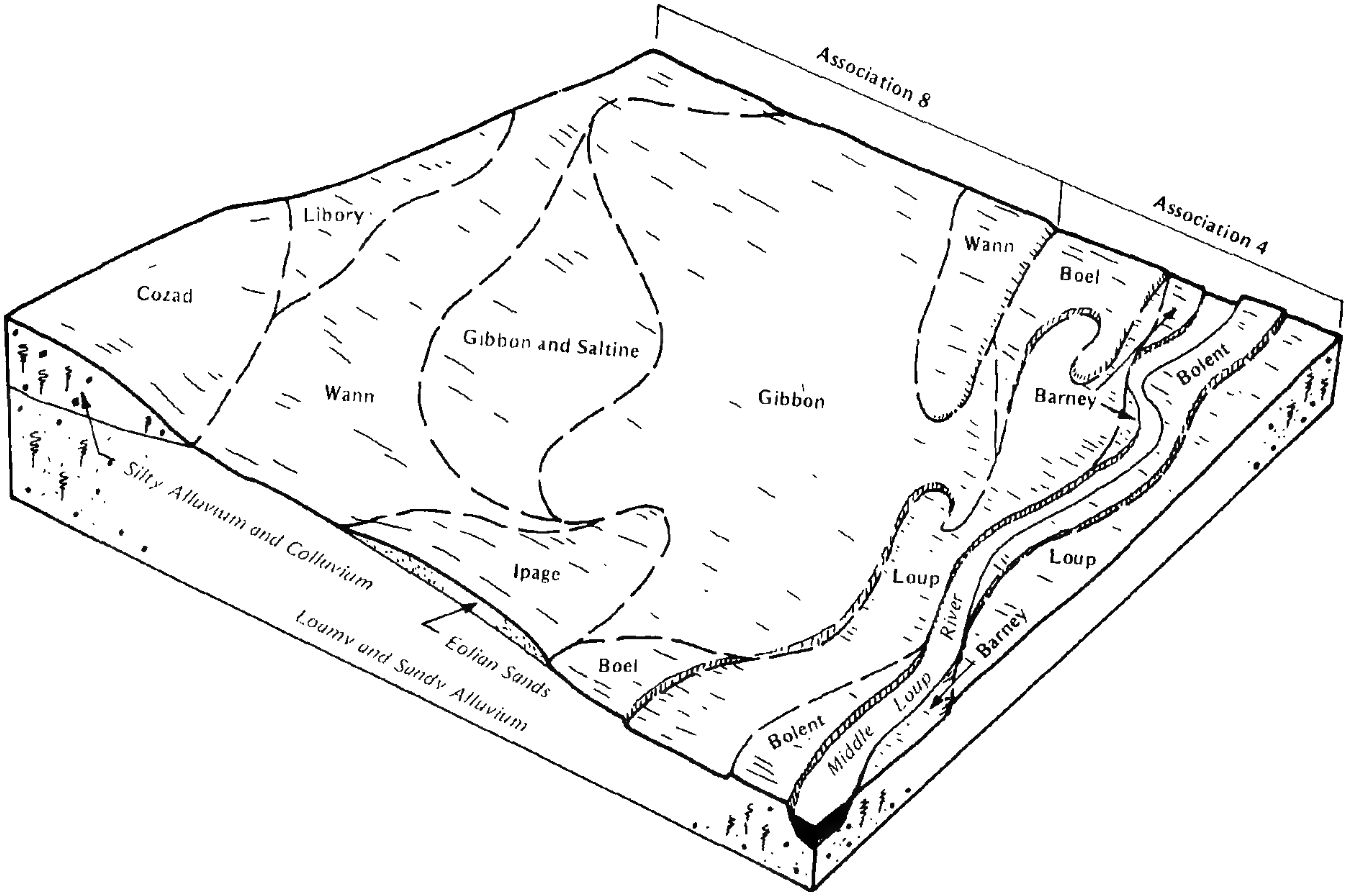

Figure 4.—Typical pattern of soils and parent material in the Loup-Bolent-Barney and Gibbon-Wann-Saltine associations.

have loamy material in the lower part.

Farms in this association are mostly a combination of cash-grain and livestock enterprises. Most include cropland on silty uplands or stream terraces in the adjacent associations. Most of the association supports native grasses and is used for grazing. A few areas are used as cropland irrigated by center-pivot sprinklers.

A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Controlling soil blowing on cropland is also a management concern in this association.

7. Cozad-Hord Association

Deep, nearly level and very gently sloping, well drained, silty soils; on stream terraces

This association consists of soils in broad, smooth areas on stream terraces. The soils formed in silty alluvium.

This association makes up 10,800 acres, or about 3 percent of the county. It is about 47 percent Cozad soils, 37 percent Hord soils, and 16 percent minor soils.

Cozad soils are nearly level and very gently sloping. Typically, the surface soil is dark grayish brown, very friable silt loam about 14 inches thick. The subsoil is grayish brown, very friable silt loam about 10 inches thick. The underlying material to a depth of more than 60 inches is light brownish gray silt loam. It is calcareous in the lower part.

Hord soils are nearly level and very gently sloping. They are slightly lower on the landscape than Cozad soils. Typically, the surface soil is dark grayish brown, friable silt loam about 16 inches thick. The subsoil is friable silt loam about 20 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of more than 60 inches is pale brown, calcareous silt loam.

Minor in this association are Hall and Hobbs soils. Hall soils are in landscape positions similar to those of

the major soils. They contain more clay in the subsoil than Hord soils. Hobbs soils are on bottom land and are stratified.

Farms in this association include parts of the adjacent associations. They are mostly a combination of cash-grain and livestock enterprises. Most of the acreage in the association is farmed, and a large part of it is irrigated, mainly by gravity systems. Sprinkler systems are used to irrigate undulating areas. Corn, alfalfa, and soybeans are the main irrigated crops. Grain sorghum and wheat are the common dryland crops. Soil blowing is a hazard unless vegetation or crop residue protects the surface. Water erosion is a slight hazard. Managing irrigation water is the main management concern in irrigated areas.

8. Gibbon-Wann-Saltine Association

Deep, nearly level, somewhat poorly drained, silty and loamy soils; on bottom land

This association consists of nearly level, somewhat poorly drained soils on bottom land. It makes up about 13,100 acres, or about 3 percent of the county. It is about 39 percent Gibbon soils, 18 percent Wann soils, 4 percent Saltine soils, and 39 percent minor soils (fig. 4).

Gibbon soils formed in calcareous, silty alluvium. Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable, calcareous silt loam about 5 inches thick. The underlying material to a depth of more than 60 inches is light brownish gray and grayish brown, mottled, calcareous silt loam.

Wann soils formed in stratified alluvium. Typically, the surface layer is dark grayish brown and grayish brown, very friable, calcareous fine sandy loam about 15 inches thick. The transition layer is grayish brown, very friable, mottled, calcareous fine sandy loam about 5 inches thick. The upper part of the underlying material is light brownish gray, mottled, calcareous fine sandy loam and loamy fine sand. The next part is very pale brown fine sand. The lower part to a depth of more than 60 inches is grayish brown sandy clay loam.

Saltine soils formed in silty alluvium. They are strongly alkaline or very strongly alkaline. They are mapped in a complex with Gibbon soils. Typically, the surface layer is gray, mottled, friable, calcareous silt loam about 7 inches thick. The subsoil is gray, mottled, firm, calcareous silty clay loam about 15 inches thick. The underlying material to a depth of more than 60 inches is mottled silt loam. The upper part is light gray, the next part is light brownish gray, and the lower part is light gray.

Minor in this association are Ipage and Libory soils. These soils are higher on the landscape than the major soils and are moderately well drained.

Farms in this association are a combination of cash-grain and livestock enterprises. Most extend into the adjacent associations and include soils on uplands and bottom land. A large acreage of the association is used as cropland, and much of it is irrigated. Water is supplied from wells and canals with gravity and sprinkler irrigation systems. Corn, alfalfa, and soybeans are the main irrigated crops. Grain sorghum, alfalfa, and soybeans are the main dryland crops.

Soil blowing is a hazard unless crops or crop residue protects the surface. In wet years the seasonal high water table is a limitation. The alkalinity of the Saltine soils is a major management concern. The alkali-affected areas tend to increase in size when the water table is highest. In areas where water ponds, salts tend to accumulate as the water evaporates. Controlling the seasonal high water table and growing salt-tolerant crops can help to overcome the alkalinity.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Holdrege silt loam, 1 to 3 percent slopes, is a phase of the Holdrege series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Uly-Coly silt loams, 15 to 30 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Differences are the result of changes and refinements in series concepts, different slope groupings, and the application of the latest classification system.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

An—Anselmo fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil formed in eolian material on uplands and stream terraces. Areas range from 10 to 150 acres in size.

Typically, the surface layer is grayish brown, very friable fine sandy loam about 8 inches thick. The subsurface layer is dark grayish brown, very friable fine sandy loam about 7 inches thick. The subsoil is very friable fine sandy loam about 14 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The upper part of the underlying material is brown fine sandy loam. The lower part to a depth of more than 60 inches is pale brown loamy very fine sand. In places the surface layer is loam.

Included with this soil in mapping are small areas of Hersh, Hord, and Holdrege soils. Hersh soils are in positions on the landscape similar to those of the Anselmo soil. They do not have a dark colored surface layer. Hord and Holdrege soils are silty. They are lower

on the landscape than the Anselmo soil. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderately rapid in the Anselmo soil. The available water capacity is moderate. The organic matter content is moderately low. Runoff is slow. The water intake rate is moderately high. This soil can be tilled throughout a wide range of moisture conditions.

Most areas of this soil are used as cropland, some of which is irrigated. Some areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, soybeans, small grain, and alfalfa. Soil blowing is a hazard unless crops or crop residue protect the surface. A conservation tillage system, such as stubble mulching, till-plant, or no-till, that keeps crop residue on the surface helps to control soil blowing. Field windbreaks can also help to control soil blowing. Returning crop residue to the soil increases the content of organic matter and improves fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, legumes, and introduced grasses. Water can be applied by gravity or sprinkler irrigation systems. Sprinkler systems are the most efficient because small, frequent applications of water are needed to minimize the leaching of plant nutrients. Soil blowing is a hazard. A conservation tillage system, such as no-till, or disc or chisel and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture.

This soil is suited to hay and pasture. Smooth bromegrass, alfalfa, and switchgrass are commonly alternated with cultivated crops as part of the cropping system. Continuous heavy grazing depletes the protective cover and causes the plants to deteriorate. Rotation grazing and proper stocking rates help to maintain or increase forage production. Introduced grasses respond well to applications of fertilizer and to irrigation.

This soil is suited to use as rangeland. This use is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Strips of sod or other vegetation between the tree rows help to control soil blowing. Timely applications of carefully selected herbicides help to control the weeds and undesirable grasses that compete with the trees and shrubs for moisture. Irrigation is needed during dry periods.

This soil is suited to use as a site for septic tank absorption fields and dwellings. The sides of shallow excavations can cave in unless they are temporarily shored. Road damage caused by frost action can be minimized by installing a good surface drainage system. Crowning the road by grading and constructing adequate ditches help to provide the needed surface drainage.

The land capability units are IIe-3, dryland, and IIe-8, irrigated; Sandy range site; windbreak suitability group 5.

Ba—Barney loam, channeled, 0 to 2 percent slopes. This deep, nearly level, very poorly drained soil formed in loamy and sandy alluvium on bottom land. Small stream channels commonly dissect the landscape. The soil is frequently flooded. Most areas are long and narrow and are adjacent to the stream channel. They range from 10 to 100 acres in size.

Typically, the surface layer is dark gray, mottled, very friable, calcareous loam about 8 inches thick. The underlying material to a depth of more than 60 inches is light gray, stratified fine sand and sand. It commonly is mottled in the upper part. In places the surface layer is silt loam or fine sandy loam.

Included with this soil in mapping are small areas of Bolent and Loup soils. These soils are higher on the landscape than the Barney soil and are subject to rare flooding. They make up 5 to 15 percent of the map unit.

Permeability is rapid in the Barney soil. The available water capacity is low. The organic matter content is moderate. Runoff is very slow. The seasonal high water table is near the surface in wet years and at a depth of about 2 feet in dry years. The water table is highest in spring, when the water flowing in the adjacent stream is highest.

Most areas support native grasses and are used for range. This soil is too wet for cultivated crops. In the areas of range or native hay, the climax vegetation is dominantly prairie cordgrass, bluejoint reedgrass, northern reedgrass, and sedges. These species make up 70 percent or more of the total annual forage. Bluegrass, slender wheatgrass, rushes, and forbs make up the rest. If subject to continuous heavy grazing or if improperly harvested for hay, prairie cordgrass, bluejoint reedgrass, and northern reedgrass decrease in abundance and are replaced by slender wheatgrass, bluegrass, green muhly, sedges, rushes, and forbs. If overgrazing or improper haying methods continue for many years, bluegrass, foxtail barley, sedges, rushes, and forbs dominate the site. When the surface is wet, overgrazing and heavy machinery traffic can cause

surface compaction and the formation of mounds and ruts, which make grazing or harvesting for hay difficult.

In most areas, the range is in good condition. The suggested initial stocking rate is only about 1.6 animal unit months per acre. This soil generally produces a high quantity of low-quality forage. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during very wet periods helps to maintain or improve the range condition. If the range is in excellent condition, the stocking rate is 2.1 animal unit months per acre.

This soil is generally not suited to the trees and shrubs grown as windbreaks because of the high water table. A few areas can be used for the trees and shrubs that enhance recreational areas or wildlife habitat or for forestation plantings if suitable species are hand planted or other special management is applied.

This soil is not suited to use as a site for septic tank absorption fields or dwellings. The main limitations are the seasonal high water table and the flooding. In addition, seepage is a limitation on sites for septic tank absorption fields. The soil readily absorbs but does not adequately filter the effluent in these fields. The poor filtering capacity can result in pollution of the underground water supplies. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are temporarily shored. Constructing roads on suitable, well compacted fill material above the level of flooding and providing adequate side ditches and culverts help to prevent the road damage caused by flooding and the seasonal high water table.

The land capability unit is VIw-7, dryland; Wetland range site; windbreak suitability group 10.

Bp—Boel fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil formed in sandy alluvium on bottom land. It is subject to rare flooding. Most areas are long and narrow and are parallel to the river. They range from 5 to 150 acres in size.

Typically, the surface layer is gray, very friable, calcareous fine sandy loam about 6 inches thick. The subsurface layer is dark gray, very friable, calcareous fine sandy loam about 6 inches thick. The transition layer is grayish brown, very friable, calcareous fine sandy loam about 3 inches thick. The underlying material to a depth of 60 inches or more is mottled fine sand. It is light gray in the upper part and white in the lower part. In places the surface layer is loam or silt loam.

Included with this soil in mapping are small areas of Loup and Wann soils. Loup soils are lower on the landscape than the Boel soil and are poorly drained and very poorly drained. Wann soils are higher on the landscape than the Boel soil. Also, they are less sandy in the lower part. Included soils make up 10 to 15 percent of the map unit.

Permeability is rapid in the Boel soil. The available water capacity is low. The organic matter content is moderately low. Runoff is slow. The water intake rate is very high. The seasonal high water table is about 1.5 feet below the surface in wet years and about 3.5 feet below the surface in dry years. This soil can be easily tilled throughout a wide range of moisture conditions.

Most of the acreage of this soil is irrigated cropland. A small acreage is used for dryland crops. The rest supports native grasses and is used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, and alfalfa. The seasonal high water table can delay tillage in spring. Soil blowing is a hazard unless crops or crop residue protects the surface. A conservation tillage system, such as disc or chisel and plant, or till-plant, that keeps crop residue on the surface helps to control soil blowing and conserves soil moisture. Returning crop residue to the soil increases the organic matter content. Adding barnyard manure improves tilth and fertility.

If irrigated, this soil is suited to corn, grain sorghum, and alfalfa. Gravity or sprinkler irrigation systems are suitable. Gravity irrigation systems require short runs and a short time of application because of the rapid permeability. Deep cuts made in land leveling operations should be avoided because they can expose the underlying sandy material. Sprinkler irrigation systems allow for more effective control of water application. Frequent, light applications of irrigation water are needed to minimize the leaching of plant nutrients into the water table. The seasonal high water table is a limitation during wet periods. Where suitable outlets are available, drainage ditches or tile drains can help to lower the water table. Soil blowing is a hazard unless crops or crop residue protects the surface. A conservation tillage system, such as no-till or till-plant, that keeps crop residue on the surface helps to control soil blowing. Returning crop residue to the soil helps to maintain the organic matter content and improves fertility.

This soil is suited to pasture and hay. Smooth bromegrass, tall wheatgrass, switchgrass, and reed canarygrass grow well. Continuous heavy grazing, untimely haying, or improper mowing heights deplete the protective cover and cause the plants to deteriorate. When the soil is wet, overgrazing can cause surface

compaction and the formation of small mounds, which make grazing or harvesting for hay more difficult. Timely mowing and restricted use during wet periods help to keep pastures in good condition.

This soil is suited to use as rangeland or native hayland. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. When the soil is wet, overgrazing can cause surface compaction and the formation of small mounds, which make grazing or harvesting for hay more difficult. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. The only suitable species are those that can withstand a high water table. Establishing trees is difficult when the water table is high. Site preparation and planting may not be possible until the water table drops and the soil is sufficiently dry. Maintaining strips of sod or other cover crops between the tree rows helps to control soil blowing. Weeds and grasses can be controlled by cultivation with conventional equipment or by timely application of carefully selected herbicides.

This soil is not suited to use as a site for septic tank absorption fields because of the seasonal high water table and seepage. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water supplies. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. Constructing dwellings on raised, well compacted fill material helps to prevent the damage caused by flooding and increases the depth to the seasonal high water table. Constructing local roads on suitable, well compacted fill material above flood levels and providing adequate side ditches and culverts help to prevent the road damage caused by flooding and the seasonal high water table. The road damage caused by frost action can be minimized by a good surface drainage system and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IIIw-6, dryland, and IIIw-11, irrigated; Subirrigated range site; windbreak suitability group 2S.

BrB—Boelus loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil is on stream terraces. It formed in sandy eolian material deposited over loess or loamy alluvium. Areas range from 10 to 60 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is brown, very friable loamy fine sand about 4 inches thick. The subsoil is about 27 inches thick. The upper part is brown, very friable loamy fine sand about 14 inches thick. The lower part is light brownish gray, very friable silt loam about 13 inches thick. The underlying material to a depth of 60 inches or more is light brownish gray and grayish brown silt loam. In some places the surface layer is fine sandy loam. In other places the soil is moderately well drained. In some areas the surface layer is light colored and very low in organic matter content.

Included with this soil in mapping are small areas of Ipage, Libory, and Valentine soils. Ipage and Valentine soils are sandy throughout. Ipage and Libory soils are in landscape positions similar to those of the Boelus soil and are moderately well drained. Valentine soils are higher on the landscape than the Boelus soil and are excessively drained. Included soils make up 10 to 15 percent of the map unit.

Permeability is rapid in the sandy upper part of the Boelus soil and moderate in the loamy lower part. The available water capacity is moderate. The organic matter content is moderately low. Runoff is slow. The water intake rate is high. The soil can be tilled throughout a wide range of moisture conditions.

Most of the acreage of this soil is irrigated cropland. A small acreage is used for dryland crops. Some areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, soybeans, small grain, and alfalfa. Alfalfa and small grain are generally better suited than other crops because they grow and mature in spring, when the amount of rainfall is higher. Soil blowing is a hazard. Droughtiness in this soil affects shallow-rooted crops and new seedlings. Plants with deep root systems can use the moisture stored in the silty underlying material. A conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil and applying barnyard manure increase the organic matter content and improve fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Gravity and sprinkler irrigation systems are suitable. Sprinkler systems are the most efficient methods because this soil has a high water intake rate and is rapidly

permeable. They permit irrigation without the extensive land leveling that is needed for gravity irrigation. Soil blowing is a hazard during seedling emergence. A conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content and improves fertility.

This soil is suited to hay and pasture. Smooth bromegrass, intermediate wheatgrass, and switchgrass are suitable alone or in a mixture with legumes. These grasses can be alternated with other crops as part of the cropping system. Separate pastures of cool-season grasses and warm-season grasses provide green forage throughout the entire growing season. Overgrazing can cause plants to lose vigor and reduces forage production. If overgrazing continues for many years, the plants are not able to stabilize the site and soil blowing is a hazard. Rotation grazing and proper stocking rates help to keep the plants in good condition. Irrigation increases forage production.

This soil is suited to use as rangeland. This use is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to maintain or improve the range condition.

This soil is suited to the trees and shrubs grown as windbreaks. The grasses and weeds that compete with the trees and shrubs can be controlled by cultivation between the rows with conventional equipment or by timely applications of the appropriate herbicide. Soil blowing can be controlled by maintaining strips of sod or a cover crop between the tree rows. Cultivation generally should be restricted to the tree rows.

This soil is generally suited to use as a site for septic tank absorption fields. The moderate permeability is a limitation, but it can be overcome by increasing the size of the absorption field. The sides of shallow excavations can cave in unless they are shored. Strengthening the foundations of buildings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Roads constructed across areas of this soil should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIIe-6, dryland, and IIIe-10, irrigated; Sandy range site; windbreak suitability group 5.

Bt—Bolent loamy sand, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil formed in sandy alluvium on bottom land. It is occasionally flooded. Areas are long and narrow and are parallel to the river. They range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy sand about 7 inches thick. The transition layer is light brownish gray, loose, calcareous fine sand about 5 inches thick. The underlying material to a depth of 60 inches or more is light gray and light brownish gray, mottled, calcareous fine sand. It is stratified in the upper part. In some places the surface layer is sand or loamy sand. In other places the entire profile is noncalcareous.

Included with this soil in mapping are small areas of Barney and Loup soils. Barney soils are lower on the landscape than the Bolent soil and are very poorly drained. Loup soils are poorly drained and very poorly drained and are slightly lower on the landscape than the Bolent soil. Included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Bolent soil. The available water capacity is low. The organic matter content also is low. Runoff is very slow. Depth to the seasonal high water table ranges from 1.5 feet in wet years to 3.5 feet in dry years.

Most areas of this soil support native grasses and are used as range. A small acreage is used for cultivated crops grown under irrigation.

If used for dryland farming, this soil is poorly suited to corn, small grain, and alfalfa. The wetness caused by the seasonal high water table or flooding can delay tillage in spring and during wet periods. Soil blowing is a hazard unless crops or crop residue protect the surface. A conservation tillage system, such as stubble mulching or disc or chisel and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content. Adding barnyard manure improves fertility.

If irrigated, this soil is poorly suited to corn. It is too sandy for gravity irrigation. Sprinkler irrigation systems are best suited because they allow better control of the application and distribution of irrigation water. This soil requires frequent, light applications of irrigation water to minimize the leaching of fertilizers and chemicals into the water table. The wetness caused by the seasonal high water table or flooding can delay tillage during wet periods. Where suitable outlets are available, drainage ditches or tile drains can help to lower the seasonal high water table. Soil blowing is a hazard unless crops or crop residue adequately protect the surface. A

conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture.

In areas of this soil used for range or native hay, the climax vegetation is dominantly big bluestem, little bluestem, indiangrass, switchgrass, and prairie cordgrass. These species make up 80 percent or more of the total annual forage. Bluegrass, sedges, and forbs make up the rest. If the plants are subject to continuous heavy grazing or are improperly harvested for hay, big bluestem, little bluestem, indiangrass, switchgrass, and prairie cordgrass decrease in abundance and are replaced by sideoats grama, western wheatgrass, bluegrass, slender wheatgrass, green muhly, sedges, and rushes. If overgrazing or improper haying continues for many years, bluegrass, sedges, rushes, and forbs dominate the site.

If the range is in excellent condition, the suggested initial stocking rate is 1.7 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during wet periods helps to maintain or improve the range condition. Properly located fences and watering and salting facilities result in a more uniform distribution of grazing.

This soil is suited to the trees and shrubs grown as windbreaks. The species selected for planting should be those that can withstand occasional wetness. Establishing seedlings and cultivating between the tree rows are difficult in some years because of the water table. Site preparation and planting should be delayed until the water table drops and the soil is sufficiently dry. Weeds and undesirable grasses that compete with the trees and shrubs can be controlled by cultivation with conventional equipment or by applications of appropriate herbicides.

This soil is not suited to use as a site for septic tank absorption fields or dwellings because of the flooding, the seasonal high water table, and seepage. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. They should be shored during a dry period. Constructing local roads on suitable, well compacted fill material and providing adequate side ditches and culverts help to prevent the road damage caused by flooding and the seasonal high water table. The damage to roads caused by frost action can be minimized by a good surface drainage system and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IVw-5, dryland, and IVw-11, irrigated; Subirrigated range site; windbreak suitability group 2S.

CrG—Coly-Hobbs silt loams, 2 to 60 percent slopes. These deep soils are on uplands and bottom land along intermittent drainageways. The steep and very steep, somewhat excessively drained and excessively drained Coly soil formed in loess on the side slopes of drainageways and divides. Catsteps are common on the side slopes. Slopes range from 20 to 60 percent. The very gently sloping, well drained Hobbs soil formed in alluvium on bottom land along the drainageways. It is occasionally flooded by runoff from the surrounding slopes. Areas range from 10 to 400 acres in size. They are about 65 to 75 percent Coly soil and about 15 to 25 percent Hobbs soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Coly soil has a surface layer of brown, very friable silt loam about 4 inches thick. The transition layer is pale brown, very friable, calcareous silt loam about 4 inches thick. The underlying material to a depth of 60 inches or more is calcareous silt loam. It is light gray in the upper part and very pale brown in the lower part.

Typically, the Hobbs soil has a surface layer of dark grayish brown, very friable silt loam about 10 inches thick. The underlying material to a depth of 60 inches or more is stratified silt loam. It is dark grayish brown, light brownish gray, and pale brown. In places the underlying material is calcareous.

Included with these soils in mapping are small areas of Uly soils on side slopes and some areas where reddish brown or grayish brown silty loess is exposed at the base of steep canyonsides. Also included are stream channels that are 2 to 10 feet deep. Included soils make up about 10 to 20 percent of the map unit.

Permeability is moderate in the Coly and Hobbs soils. The available water capacity is high. The organic matter content is moderately low in the Coly soil and moderate in the Hobbs soil. Runoff is very rapid on the Coly soil and slow on the Hobbs soil.

Almost all areas support native grasses and are used for grazing. These soils are generally not suited to cultivated crops. Most areas of the Hobbs soil are too small, too irregular in shape, or too inaccessible for cultivation. The Coly soil is too steep for cultivation.

In the areas used as range, the climax vegetation on

the Coly soil is dominantly big bluestem, little bluestem, and sideoats grama. These species make up 65 percent or more of the total annual forage on this soil. Indiangrass, switchgrass, plains muhly, sedges, and forbs make up the rest. The climax vegetation on the Hobbs soil is dominantly big bluestem, little bluestem, western wheatgrass, and switchgrass. These grasses make up 75 percent or more of the total annual forage on this soil. Sideoats grama, sedges, and forbs make up the rest.

If the range is subject to continuous heavy grazing, big bluestem and switchgrass decrease in abundance on both soils. On the Coly soil, these species are initially replaced by blue grama, hairy grama, plains muhly, prairie sandreed, needleandthread, and forbs. If overgrazing continues for many years, the plants lose vigor and are unable to stabilize the site. As a result, water erosion is excessive on the Coly soil, causing runoff onto the Hobbs soil. If heavy grazing continues on the Hobbs soil, western wheatgrass, blue grama, bluegrass, and sedges increase in abundance. Although brief in duration, flooding causes channeling and the deposition of debris and weed seeds. To prevent compaction on the Hobbs soil, grazing should be delayed after floods.

If the range is in excellent condition, the suggested initial stocking rate is 0.6 animal unit month per acre on the Coly soil and 1.0 animal unit month per acre on the Hobbs soil. The stocking rate depends on the percentage of each soil in the pasture. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Range animals have difficulty in crossing the very steep areas of Coly soil.

The Coly soil is generally unsuited to the trees and shrubs grown as windbreaks. The slope of this soil prevents the use of conventional tillage and tree-planting equipment. Some areas of this soil can be used for the trees and shrubs that enhance recreation areas or wildlife habitat and for forestation plantings if suitable species are hand planted or other special management is applied. The Hobbs soil is suited to the trees and shrubs grown as windbreaks. Grasses and weeds that compete with the trees can be controlled by cultivating between the tree rows with conventional equipment and by applying carefully selected herbicides in the rows.

These soils are not suited to use as sites for septic tank absorption fields or dwellings because of the slope of the Coly soil and the flooding on the Hobbs soil. Suitable alternative sites are needed. On the Coly soil, cutting and filling are needed to provide a suitable grade for roads. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the Hobbs soil. Providing coarser grained base material in areas of the Hobbs soil helps to ensure better performance. Constructing the roads on suitable, well compacted fill material above flood levels and providing adequate side ditches and culverts help to prevent the road damage caused by flooding on the Hobbs soil.

The land capability unit is VIIe-9, dryland. The Coly soil is in the Thin Loess range site and in windbreak suitability group 10. The Hobbs soil is in the Silty Overflow range site and in windbreak suitability group 1.

CuD2—Coly-Uly silt loams, 6 to 11 percent slopes, eroded. These deep, strongly sloping, well drained soils formed in loess on uplands. Most areas of these soils are on upland divides and eroded side slopes adjacent to steeply sloping upland drainageways. The Coly soil is on the crest of ridges and the upper parts of side slopes. The Uly soil is on the less sloping, lower parts of side slopes and in concave areas. Small rills, which are common after rains, generally are eliminated during tillage. Erosion and tillage have removed most of the original surface soil. Areas range from 10 to 100 acres in size. They are about 45 to 65 percent Coly soil and 30 to 45 percent Uly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Coly soil has a surface layer of light brownish gray, very friable, calcareous silt loam about 4 inches thick. The transition layer is pale brown, calcareous, very friable silt loam about 4 inches thick. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Typically, the Uly soil has a surface layer of grayish brown, friable silt loam about 5 inches thick. The subsoil is friable silt loam about 11 inches thick. It is light brownish gray in the upper part and light gray in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Hobbs and Holdrege soils. Hobbs soils are stratified and are on foot slopes and along upland drainageways. Holdrege soils are less sloping than the Coly and Uly soils. Also, they have more clay in the subsoil. Included soils make up 5 to 15 percent of the map unit.

Permeability in the Coly and Uly soils is moderate. The available water capacity is high. The organic matter content is low in the Coly soil and moderately low in the

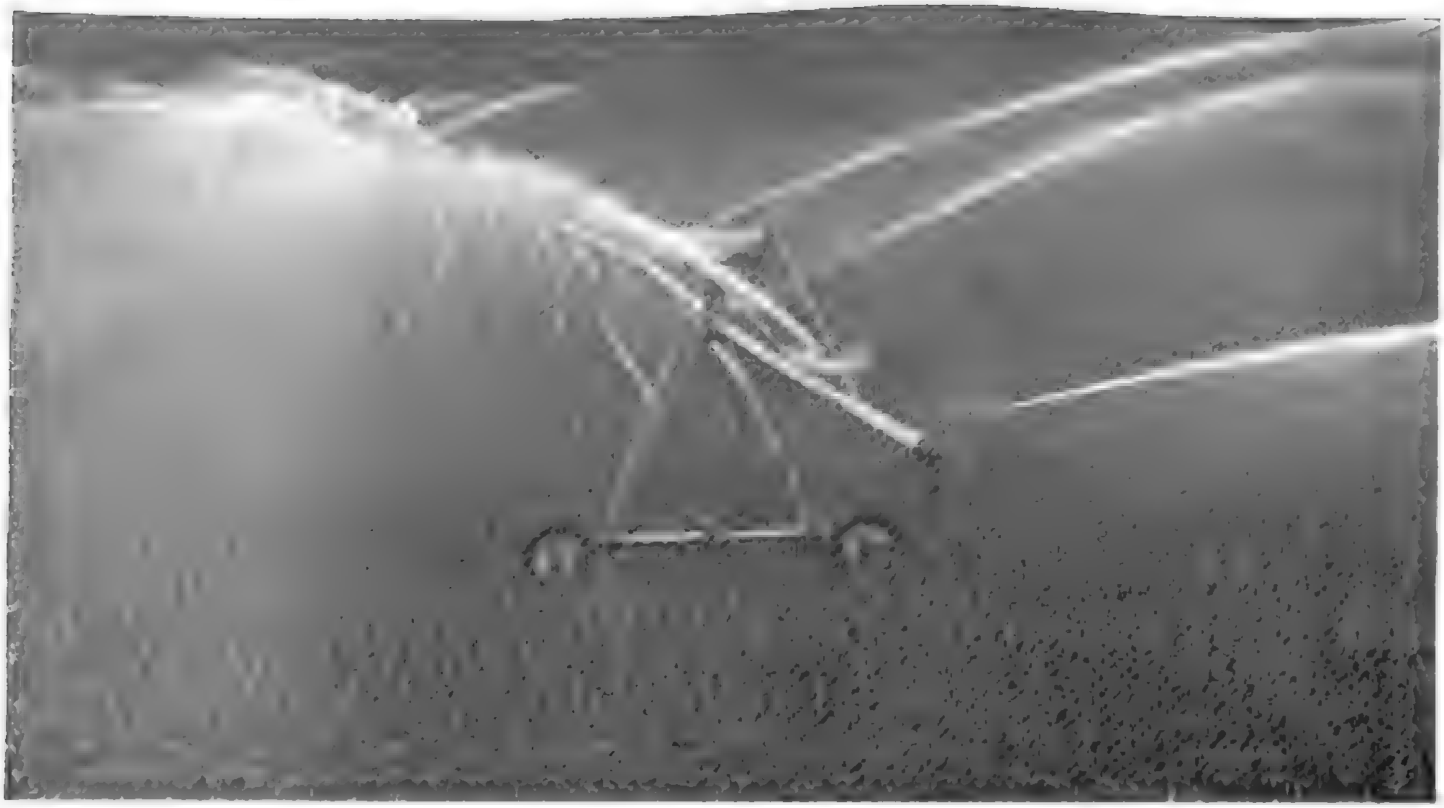

Figure 5.—Corn irrigated by a center-pivot system in an area of Coly-Uly silt loams, 6 to 11 percent slopes, eroded.

Uly soil. Runoff is rapid on both soils.

Nearly all of the acreage of these soils is used as cropland. Much of it is irrigated by center-pivot systems (fig. 5). A few areas that formerly were farmed have been seeded to grass.

If used for dryland farming, these soils are poorly suited to corn, small grain, grain sorghum, and alfalfa. Soil blowing and water erosion are hazards unless crops or crop residue protects the surface. A conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and water erosion and conserves moisture. Terraces, contour farming, and grassed waterways help to control water erosion.

If irrigated, these soils are poorly suited to row crops. They are better suited to alfalfa and introduced grasses. Sprinkler irrigation is the only suitable method of water application on these soils. Water erosion is a severe hazard. Discing, chiseling, or other systems of conservation tillage that keep the crop residue on the surface help to control soil blowing and water erosion. Terraces, grassed waterways, and contour farming help to control water erosion. Including alfalfa and introduced grasses in the cropping system helps to control water erosion.

These soils are suited to hay and pasture. Smooth bromegrass, orchardgrass, legume mixtures, and switchgrass are suitable. Overgrazing can cause the plants to lose vigor and reduces forage production. If continuously overgrazed for many years, the plants are unable to stabilize the site and water erosion is a hazard. Small gullies and rills can form after heavy rains. Separate pastures of cool-season grasses and warm-season grasses provide green forage throughout

the growing season. Rotation grazing and proper stocking rates help to keep the plants in good condition. Irrigation and applications of fertilizer increase forage production.

These soils are suited to rangeland. This use is effective in controlling soil blowing and water erosion. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. It also can result in a severe hazard of water erosion. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition. Range seeding may be needed to stabilize severely eroded cropland.

These soils are suited to the trees and shrubs grown as windbreaks (fig. 6). Water erosion and insufficient seasonal rainfall are management concerns. Planting the tree rows on the contour, terracing, and maintaining strips of sod or cover crops between the rows help to control water erosion. Good site preparation, cultivation between the tree rows with conventional equipment, and applications of carefully selected herbicides help to control weeds and grasses that compete with the trees for moisture. Irrigation is needed during dry periods.

These soils are generally suited to use as sites for septic tank absorption fields. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings can be designed so that they conform to the natural slope of the land, or the site can be graded to a suitable gradient. If roads are constructed across these soils, cutting and filling are needed to provide a suitable grade. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soils. Providing coarser grained base material helps to ensure better performance. Installing a good surface drainage system minimizes the damage caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed drainage.

The land capability units are IVe-8, dryland, and IVe-6, irrigated. The Coly soil is in the Limy Upland range site and in windbreak suitability group 8. The Uly soil is in the Silty range site and in windbreak suitability group 3.

CuE2—Coly-Uly silt loams, 11 to 17 percent slopes, eroded. These deep, moderately steep, somewhat excessively drained soils formed in loess on uplands. The Coly soil is on ridgetops and the eroded upper side slopes. The Uly soil is on the plane or slightly concave lower side slopes. Rills and small gullies are common after rains, and some are evident after tillage. Areas range from 5 to 200 acres in size. They are 50 to 70 percent Coly soil and 20 to 40 percent Uly soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

Typically, the Coly soil has a surface layer of pale brown, very friable, calcareous silt loam about 6 inches thick. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam.

Typically, the Uly soil has a surface layer of pale brown, friable silt loam about 5 inches thick. The subsoil is pale brown, friable silt loam about 4 inches thick. The underlying material to a depth of more than 60 inches is calcareous silt loam. The upper part is light gray, and the lower part is very pale brown.

Included with these soils in mapping are small areas of the stratified Hobbs soils along drainageways. Also included are small areas where reddish brown loess is exposed on some of the lower side slopes. Included soils make up about 10 to 15 percent of the map unit.

Permeability is moderate in the Coly and Uly soils. The available water capacity is high. The organic matter content is low in the Coly soil and moderately low in the Uly soil. Runoff is rapid on both soils.

A large acreage is used as cropland. These soils are generally not suited to dryland or irrigated crops because water erosion is a very severe hazard. Some areas that were formerly farmed have been seeded to grasses and are used as range or pasture. Reseeding to grasses is a desirable alternative to farming.

In areas of these soils used as range, the climax vegetation is dominantly big bluestem, little bluestem, blue grama, sideoats grama, and western wheatgrass. These species make up 75 percent or more of the total annual forage. Indiangrass, switchgrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, western wheatgrass, needleandthread, Scribner panicum, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.7 animal unit month per acre on the Coly soil and 0.9 animal unit month per acre on the Uly soil. The proper stocking rate depends on the percentage of each soil in the pasture. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or

Figure 6.—A field windbreak of redcedar in an area of Coly-Uly silt loams, 6 to 11 percent slopes, eroded. Native grass between the tree rows helps to control water erosion.

improve the range condition. Properly locating fences and watering and salting facilities can result in a more uniform distribution of grazing.

Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is reseeded.

These soils are suited to the trees and shrubs grown as windbreaks. On the Coly soil, the suitable species are those that can stand an excessive amount of carbonates. Weeds and grasses that compete with the trees for moisture can be controlled by cultivating between the tree rows with conventional equipment or by applying appropriate herbicides. A combination of contour planting and terraces helps to control water erosion. Irrigation is needed during dry periods.

These soils are generally suited to use as sites for septic tank absorption fields, but they are unsuited where the slope is more than 15 percent. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Dwellings can be designed so that they conform to the natural slope of the land, or the site can be graded to a suitable gradient. Roads that cross these soils should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil material. Providing coarser grained base material helps to ensure better performance. Installing a surface drainage system minimizes the road damage caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Cutting and filling help to provide a suitable grade.

The land capability unit is VIe-8, dryland. The Coly soil is in the Limy Upland range site and in windbreak suitability group 8. The Uly soil is in the Silty range site and in windbreak suitability group 3.

Cz—Cozad silt loam, terrace, 0 to 1 percent slopes. This deep, nearly level, well drained soil formed

in silty alluvium on stream terraces. It is subject to rare flooding. Areas range from 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 7 inches thick. The subsurface layer also is dark grayish brown, very friable silt loam about 7 inches thick. The subsoil is grayish brown, very friable silt loam about 10 inches thick. The underlying material to a depth of more than 60 inches is stratified, light brownish gray, very friable silt loam. It is calcareous at a depth of about 36 inches. In some places land grading operations have removed the surface soil and exposed the subsoil. In other places the surface soil is more than 20 inches thick. In some areas buried soils are in the lower part of the profile.

Included with this soil in mapping are small areas of Hobbs and Hord soils. Hobbs soils are on the lower parts of the landscape and are stratified throughout. Hord soils are in landscape positions similar to those of the Cozad soil. They are dark to a greater depth than the Cozad soil. Also included are some areas of moderately well drained soils. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. The available water capacity is high. The organic matter content is moderately low. Runoff is slow. The water intake rate is moderate.

Most of the acreage of this soil is used as irrigated cropland. A few small areas support grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. Insufficient seasonal rainfall is a management concern. A conservation tillage system, such as disc or chisel and plant, that keeps crop residue on the surface conserves moisture and helps to control soil blowing. Returning crop residue to the soil and adding barnyard manure increase the organic matter content and improve fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suited to both gravity and sprinkler irrigation systems. The efficient use of water is important when the soil is irrigated. Land leveling is commonly needed to establish a suitable grade for gravity irrigation. Tailwater recovery systems conserve irrigation water and fertilizer. A conservation tillage system, such as disc or chisel and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture.

Smooth bromegrass, orchardgrass, intermediate wheatgrass, alfalfa, switchgrass, and big bluestem grow well on this soil. Separate pastures of cool- and warm-season grasses can provide forage throughout the grazing season. Overgrazing causes plants to lose vigor and reduces forage production. Proper stocking rates and rotation grazing help to keep the plants in good condition. Applying fertilizer increases forage production.

This soil is suited to range and native hay. These uses are effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Weeds and grasses that compete with the trees for moisture can be controlled by cultivating between the tree rows with conventional equipment and by applying appropriate herbicides. Irrigation is needed during dry periods.

The flooding and the moderate permeability are moderate limitations if this soil is used as a site for septic tank absorption fields. The absorption fields should be protected from floodwater. Increasing the size of the absorption field helps to overcome the moderate permeability. Constructing dwellings on raised, well compacted fill material helps to prevent the structural damage caused by flooding. Installing a surface drainage system minimizes the damage to local roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Constructing the roads on suitable, well compacted fill material above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by flooding.

The land capability units are IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

CzB—Cozad silt loam, terrace, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil formed in silty alluvium on stream terraces. It is subject to rare flooding. Areas range from 5 to 140 acres in size.

Typically, the surface layer is dark grayish brown, very friable silt loam about 7 inches thick. The subsoil is grayish brown, friable silt loam about 10 inches thick. The underlying material to a depth of more than 60 inches is silt loam. It is light brownish gray in the upper part, dark grayish brown and grayish brown in the next part, and light brownish gray in the lower part. It is calcareous at a depth of about 32 inches. In some places land grading operations have removed the surface soil and exposed the subsoil.

Included with this soil in mapping are small areas of Hobbs and Hord soils. Hobbs soils are lower on the landscape than the Cozad soil and are stratified throughout. Hord soils are in landscape positions similar to those of the Cozad soil. They are dark to a greater depth than the Cozad soil. Also included are some areas of moderately well drained soils. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Cozad soil. The available water capacity is high. The organic matter content is moderately low. Runoff is slow. The water intake rate is moderate.

A large acreage of this soil is used for cultivated crops grown under irrigation. Some small areas on the high stream terraces support native grasses and are used for grazing.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. Water erosion is a hazard unless crops or crop residue protect the surface. A conservation tillage system, such as disc or chisel and plant, or till-plant, that keeps crop residue on the surface helps to control water erosion and conserves moisture. Terraces and contour farming help to control erosion. Returning crop residue to the soil and adding barnyard manure increase the organic matter content and improve fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suited to gravity and sprinkler irrigation systems. Land leveling is generally needed to establish a suitable grade for gravity irrigation. The efficient use of irrigation water is important. Irrigation tailwater recovery systems improve efficiency. A conservation tillage system, such as disc or chisel and plant, or till-plant, that keeps crop residue on the surface helps to control erosion and conserves moisture. Terraces and contour farming help to control water erosion.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, intermediate wheatgrass, switchgrass, and big bluestem can be alternated with other crops as part of the cropping system. Proper stocking rates and rotation grazing help to keep the pasture in good condition. Introduced grasses and legumes respond well to applications of fertilizer and to irrigation.

This soil is suited to range and native hay. These uses are effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Seedlings generally survive and grow well if competing vegetation is controlled. Weeds and grasses that compete with the trees can be controlled by cultivating between the tree rows with conventional equipment and by applying the appropriate herbicides. Irrigation is needed during dry periods.

The moderate permeability and the flooding are moderate limitations if this soil is used as a site for septic tank absorption fields. The absorption fields should be protected from floodwater. Increasing the size of the absorption field generally helps to overcome the moderate permeability. Constructing dwellings on raised, well compacted fill material helps to prevent the structural damage caused by flooding. Installing a surface drainage system minimizes the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. Constructing the roads on suitable, well compacted fill material above flood levels and providing adequate side ditches and culverts help to prevent the damage caused by flooding.

The land capability units are IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

Fu—Fluvaquents, sandy. These deep, very poorly drained soils formed in sandy alluvium in oxbows and low areas bordering large streams. They are frequently flooded. Slopes range from 0 to 2 percent. Areas are long and narrow and range from 5 to 100 acres in size.

Typically, a layer of decaying organic matter about 2 inches thick is at the surface. The surface layer is gray, very friable fine sandy loam about 7 inches thick. The underlying material to a depth of more than 60 inches is stratified white, gray, and light brownish gray fine sand and loamy fine sand. In places the underlying material has strata of sandy loam and loam.

Included with these soils in mapping are small areas of Barney and Loup soils. These included soils are higher on the landscape than the Fluvaquents and have a water table at a greater depth. Also included are areas where the soil is stratified silty and loamy material throughout. Included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Fluvaquents. The available water capacity is low. The organic matter content is high. Runoff is generally ponded. The seasonal high water table ranges from 2 feet above the surface in wet years to 1 foot below the surface in dry

years. In most years water covers the surface for long periods. During extended dry periods the water table recedes below the surface.

These soils provide good habitat for wetland wildlife. They are too wet for cultivated crops, hay, and range. The vegetation is dominantly cattails, rushes, arrowheads, willows, and other water-tolerant plants. Prairie cordgrass and reed canarygrass can be established in some areas.

These soils are not suited to the trees and shrubs grown as windbreaks because of the seasonal high water table and the flooding. Some areas can be used for the trees and shrubs that enhance recreational areas or wildlife habitat if suitable species are hand planted or other special management is applied.

These soils are not suited to use as sites for septic tank absorption fields or dwellings because of the ponding and the flooding. A suitable alternative site is needed. Constructing roads on suitable, well compacted fill material above the level of ponding and providing adequate side ditches and culverts help to prevent road damage caused by ponding and flooding.

The land capability unit is VIIIw-7, dryland; windbreak suitability group 10. No range site is assigned.

Gn—Gibbon silt loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil formed in calcareous, silty alluvium on bottom land along streams. It is subject to rare flooding. Areas range from 10 to more than 400 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown, friable, calcareous silt loam about 5 inches thick. The underlying material to a depth of more than 60 inches is mottled, calcareous silt loam. It is light brownish gray in the upper part, grayish brown in the next part, and light brownish gray in the lower part. In some places carbonates have been leached from the upper part of the profile. In other places the surface layer is silty clay loam or very fine sandy loam. In some areas fine sand is below a depth of 40 inches.

Included with this soil in mapping are small areas of Cozad, Wann, and Saltine soils. Cozad soils are higher on the landscape than the Gibbon soil and are well drained. Wann and Saltine soils are in positions on the landscape similar to those of the Gibbon soil. Wann soils are coarser textured than the Gibbon soil, and Saltine soils contain more salts. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Gibbon soil. The available water capacity is high. The organic matter content is moderate. Runoff is very slow. The seasonal high water table ranges from a depth of 1.5 feet in wet years to a depth of about 3.0 feet in dry years. The water intake rate is moderate.

Most of the acreage of this soil is used for cultivated crops grown under irrigation. Some areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, soybeans, and alfalfa. In some years the seasonal high water table delays tillage operations and causes the soil to warm up slowly in spring. Moisture from the water table is beneficial to deep-rooted crops.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suitable for gravity and sprinkler irrigation systems. Land leveling is generally needed to establish a suitable grade for gravity irrigation. In most years the seasonal high water table delays tillage operations in spring. Open drainage ditches can help to lower the water table where suitable outlets are available.

This soil is suited to pasture and hay. Smooth bromegrass, big bluestem, switchgrass, and reed canarygrass can tolerate the wetness caused by the seasonal high water table. Proper stocking rates and rotation grazing increase forage production. Introduced grasses respond well to applications of fertilizer. Delaying grazing in spring until the surface is firm and the grasses reach a suitable height helps to keep the pasture in good condition.

This soil is suited to range and native hay. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. When the soil is wet, overgrazing can cause surface compaction and the formation of small mounds, which make grazing or harvesting for hay difficult. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. The only suitable species are those that can tolerate occasional wetness. Competition from weeds and grasses can be controlled by cultivating between the tree rows with conventional equipment or by applying appropriate herbicides.

The seasonal high water table is a severe limitation if this soil is used as a site for septic tank absorption fields. The absorption fields can be constructed on fill material, which raises them a sufficient distance above the water table. Constructing dwellings on raised, well compacted fill material helps to prevent the structural damage caused by flooding and increases the depth to the seasonal high water table. Installing a surface

drainage system and a gravel moisture barrier in the subgrade minimizes the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IIw-4, dryland, and IIw-6, irrigated; Subirrigated range site; windbreak suitability group 2S.

Gs—Gibbon-Saltine silt loams, 0 to 1 percent slopes. These deep, nearly level, somewhat poorly drained soils formed in silty alluvium on bottom land. They are subject to rare flooding. The Saltine soil is strongly alkaline or very strongly alkaline. Areas range from 5 to 240 acres in size. They are 60 to 70 percent Gibbon soil and 25 to 40 percent Saltine soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Gibbon soil has a surface layer of gray, friable, calcareous silt loam about 8 inches thick. The subsurface layer is dark gray, friable, calcareous silt loam about 7 inches thick. The transition layer is light brownish gray, mottled, friable, calcareous silt loam about 10 inches thick. The underlying material to a depth of more than 60 inches is silty clay loam. It is grayish brown and mottled in the upper part, light brownish gray and mottled in the next part, and light gray in the lower part. In places the surface layer and subsurface layer are silty clay loam.

Typically, the Saltine soil has a surface layer of gray, mottled, friable, calcareous silt loam about 7 inches thick. The subsoil is gray, mottled, friable, calcareous silty clay loam about 15 inches thick. The underlying material to a depth of more than 60 inches is mottled silt loam. The upper part is light gray, the next part is light brownish gray, and the lower part is light gray. In places the underlying material has sandy strata.

Included with these soils in mapping are small areas of Boel and Wann soils. Boel soils are lower on the landscape than the Gibbon and Saltine soils. They are sandy throughout. Wann soils are in landscape positions similar to those of the Gibbon and Saltine soils. Also, they have more sand in the underlying material. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderate in the Gibbon soil and moderately slow in the Saltine soil. The available water capacity is high in the Gibbon soil and moderate in the Saltine soil. The organic matter content is moderate in the Gibbon soil and moderately low in the Saltine soil. Runoff is very slow on both soils. The seasonal high water table ranges from a depth of about 2 feet in wet years to about 3 feet in dry years. The water intake rate is moderate. Tilth is very poor in the Saltine soil because the sodium salts cause puddling. The alkalinity of this soil is not uniform from area to area.

Most areas of these soils are used as irrigated cropland. A few small areas support native grasses and are used as range.

If used for dryland farming, these soils are poorly suited to corn, small grain, grain sorghum, and alfalfa. The Saltine soil is best suited to salt-tolerant crops, such as oats, barley, and grain sorghum. Applying sulphur or gypsum according to the results of soil tests can reduce the alkalinity of this soil and improve soil structure and crop growth. Surface drainage can be improved by filling in low areas, which provides an even land grade throughout the field. Delaying tillage during wet periods helps to prevent surface compaction. Adding crop residue, barnyard manure, corn cobs, and other organic material to the Saltine soil improves water infiltration, tilth, and the ease of tillage.

If irrigated, these soils are poorly suited to corn, grain sorghum, alfalfa, and introduced grasses. Salt-tolerant crops, such as grain sorghum and alfalfa, are better suited than other crops. Gravity and sprinkler irrigation systems are suitable. If a gravity system is used, land leveling is needed to improve surface drainage and to distribute irrigation water more evenly. Installing adequate surface and subsurface drains can reduce the effects of excess salts. Either tile drains or open drainage ditches can be used where suitable outlets are available. Applying gypsum and sulfur according to the results of soil tests can improve soil structure and crop growth. Frequent and timely irrigation can help to leach the salts and alkali below the root zone after the water table has been lowered. The water application rate should be adjusted to the intake rate of the soils. Deep chiseling temporarily increases the water intake rate. Applying barnyard manure helps to maintain the organic matter content and improves fertility.

If managed properly, these soils are suited to pasture and hay. They are best suited to salt-tolerant grasses, such as tall wheatgrass, western wheatgrass, and switchgrass. Continuous overgrazing or grazing when the soils are wet causes deterioration of the pasture. Proper grazing use, rotation grazing, and timely deferment of grazing help to maintain or improve the pasture. In severely alkaline areas, the production of grass for hay or pasture is an economical alternative to farming.

These soils are suited to range, either for grazing or haying. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the

native plants to deteriorate. When the soils are wet, overgrazing can cause surface compaction and the formation of small mounds, which make grazing or harvesting for hay difficult. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the native plants in good condition. The alkali limits forage production and the kinds of plants that can be grown. Some very strongly alkaline areas support little or no vegetation and are subject to soil blowing during dry periods. Careful management is needed to maintain the plant cover.

The Saltine soil is poorly suited to the trees and shrubs grown in windbreaks. The only suitable species are those that can tolerate severe alkalinity and the occasional wetness caused by the seasonal high water table. The Gibbon soil is suited to the trees and shrubs that can tolerate occasional wetness. Cultivating between the tree rows with conventional equipment and applying carefully selected herbicides at the proper time help to control undesirable weeds and grasses.

If these soils are used as sites for septic tank absorption fields, the sites should be protected from floodwater. Constructing the absorption fields on fill material raises them a sufficient distance above the seasonal high water table. Increasing the size of the absorption field helps to overcome the moderately slow permeability of the Saltine soil. Constructing dwellings on raised, well compacted fill material helps to overcome the wetness caused by the seasonal high water table and helps to prevent the structural damage caused by flooding.

Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the Saltine soil. Providing coarser grained base material helps to ensure better performance on both soils. Installing a surface drainage system and a gravel moisture barrier in the subgrade minimizes the damage caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IVs-1, dryland, and IVs-6, irrigated. The Gibbon soil is in the Subirrigated range site and windbreak suitability group 2S. The Saltine soil is in the Saline Subirrigated range site and windbreak suitability group 9S.

Ha—Hall silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil formed in loess on uplands. Areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is about 16 inches thick. It is dark grayish brown and friable. It is silt loam in the upper part and silty clay loam in the lower part. The subsoil is friable silty clay loam about 19 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam. In some places the subsoil contains less clay. In other places the surface soil is less than 20 inches thick.

Included with this soil in mapping are small areas of Holdrege soils. These soils are higher on the landscape than the Hall soil. Also, they have a thinner surface soil. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Hall soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water intake rate is moderately low.

Most of the acreage of this soil is used as irrigated cropland. A few small areas adjacent to steep canyons support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. In most years insufficient seasonal rainfall limits dryland crop production. A conservation tillage system, such as chisel or disc and plant, or till-plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Working the soil when it is too wet results in compaction.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. Gravity irrigation is used where fields are uniform in shape and grade. Center-pivot systems are common. They better control the application rate and distribution of irrigation water. The efficient use of irrigation water is a management concern. Tailwater recovery systems can be used to conserve irrigation water and fertilizer. A system of conservation tillage, such as disc or chisel and plant, that keeps crop residue on the surface conserves moisture.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with cultivated crops as part of the cropping system. Proper stocking rates and rotation grazing can maintain or improve forage production. Introduced grasses and legumes respond well to applications of fertilizer and to irrigation.

This soil is suited to range and native hay. These uses are effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants

to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Cultivation between the tree rows with conventional equipment and timely applications of carefully selected herbicides in the rows help to control undesirable grasses and weeds.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of dwellings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIc-1, dryland, and I-4, irrigated; Silty range site; windbreak suitability group 3.

Hb—Hall silt loam, terrace, 0 to 1 percent slopes. This deep, nearly level, well drained soil formed in silty alluvium on stream terraces. It is subject to rare flooding. Areas range from 5 to 30 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The subsurface layer also is dark gray, friable silt loam. It is about 7 inches thick. The subsoil is friable silty clay loam about 27 inches thick. It is dark gray in the upper part, dark grayish brown in the next part, and grayish brown in the lower part. The underlying material to a depth of more than 60 inches is light brownish gray silt loam. In some places the dark material extends to a depth of less than 20 inches. In other places land grading operations have removed the upper layers and exposed the silty clay loam subsoil.

Included with this soil in mapping are small areas of Hobbs and Hord soils. Hobbs soils are lower on the landscape than the Hall soil. They are stratified. Hord soils are in landscape positions similar to those of the Hall soil. They have less clay in the subsoil than the Hall soil. Included soils make up 5 to 10 percent of the map unit.

Permeability is moderate in the Hall soil. The available water capacity is high. The organic matter content is moderate. Runoff is very slow.

Most of the acreage of this soil is used as irrigated cropland. A few areas are used for dryland crops. Some small areas adjacent to the major creeks support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, soybeans, and alfalfa. In most years insufficient seasonal rainfall is a limitation. Soil blowing is a slight hazard unless crops or crop residue protects the surface. A conservation tillage system, such as chisel or disc and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue and green manure crops to the soil increases the organic matter content and improves fertility.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, soybeans, and introduced grasses. Gravity irrigation is most common, but some sprinklers are used. The efficient use of irrigation water is a management concern. Where a gravity system is used, a tailwater recovery system can conserve irrigation water and fertilizer. Pits are used to collect and store the irrigation runoff for reuse. Soil blowing is a hazard unless the surface is protected. A conservation tillage system, such as chisel or disc and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content and improves fertility.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Separate pastures of cool-season grasses and warm-season grasses provide green forage throughout the entire growing season. Rotation grazing and proper stocking rates help to keep the pasture in good condition. In most areas irrigation and applications of nitrogen fertilizer can increase forage production.

This soil is suited to range and native hay. These uses are effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Grasses and weeds compete with the trees for moisture. Cultivating between the tree rows with conventional equipment and applying carefully selected herbicides at the proper time help to control these undesirable plants.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of dwellings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Local roads should be designed

so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIc-1, dryland, and I-4, irrigated; Silty Lowland range site; windbreak suitability group 3.

HeC—Hersh fine sandy loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil formed in loamy and sandy eolian material on uplands and stream terraces. Areas range from 10 to 100 acres in size.

Typically, the surface layer is light brownish gray, very friable fine sandy loam about 8 inches thick. The transition layer is brown, very friable fine sandy loam about 6 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sandy loam. In some places the surface layer and underlying material are very fine sandy loam. In other places the surface layer is loamy fine sand.

Included with this soil in mapping are small areas of Anselmo, Boelus, and Valentine soils. Anselmo soils are in landscape positions similar to those of the Hersh so l. Their surface soil is thicker than that of the Hersh soil. Boelus soils are lower on the landscape than the Hersh soil. They have silty underlying material. Valentine soils are higher on the landscape than the Hersh soil. Also, they have more sand throughout. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderately rapid in the Hersh soil. The available water capacity is moderate. The organic matter content is low. Runoff is slow. The water intake rate is moderately high. This soil absorbs moisture easily and readily releases it to plants.

About half of the acreage of this soil is used as cropland. Some areas are irrigated. About half of the acreage supports native grasses and is used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, and alfalfa. Soil blowing and water erosion are hazards unless crops or crop residue adequately protect the surface. The soil is droughty. A conservation tillage system, such as stubble mulching or till-plant, that keeps crop residue on the surface helps to control soil blowing and water erosion and conserves moisture. In areas where slopes are suitable, terraces and contour farming help to control water erosion. Returning crop residue to the soil increases the organic matter content and improves fertility.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. Sprinkler irrigation is generally the most practical system because small, frequent applications of irrigation water are needed. The efficient use of irrigation water is a management concern. Soil blowing and water erosion are hazards unless crops or crop residue adequately protect the surface. A conservation tillage system, such as no-till, or chisel or disc and plant, that keeps the crop residue on the surface helps to control soil blowing and water erosion. In areas where slopes are suitable, terraces and contour farming also help to control water erosion. Returning crop residue to the soil increases the organic matter content and improves fertility.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Continuous overgrazing depletes the protective cover and causes deterioration of the pasture. When the pasture is overgrazed, the plants are unable to stabilize the site and soil blowing is a hazard. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Applications of fertilizer and irrigation can increase forage production.

On the areas of range, the climax vegetation is dominantly prairie sandreed, sand bluestem, needleandthread, and little bluestem. These species make up 80 percent or more of the total annual forage. Blue grama, switchgrass, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, Scribner panicum, sand dropseed, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. On an overgrazed range site, water erosion and soil blowing are excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Areas of this soil are generally the first to be overgrazed in a pasture that includes Sands or Choppy Sands range sites. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. If areas previously used as cropland are used as range, reseeding helps to control soil blowing and water erosion.

This soil is suited to the trees and shrubs grown as windbreaks. Maintaining strips of sod or other vegetation between the tree rows helps to control soil blowing. Weeds and grasses compete with the trees for

soil moisture. Cultivating with conventional equipment or applying the appropriate herbicides at the proper time helps to control the undesirable plants. Irrigation is needed during dry periods.

This soil is generally suited to use as a site for septic tank absorption fields and dwellings. Dwellings can be designed so that they conform to the natural slope of the land, or the site can be graded. Installing a surface drainage system minimizes the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IIIe-3, dryland, and IIIe-8, irrigated; Sandy range site; windbreak suitability group 5.

HgF—Hersh-Valentine complex, 9 to 24 percent slopes. These deep, well drained and excessively drained, moderately steep soils formed in loamy and sandy eolian material. They are on the breaks to the uplands along the Middle Loup River. The Hersh soil is on smooth side slopes. The Valentine soil is on small hummocks and dunes. Areas range from 10 to 400 acres in size. They are 60 to 70 percent Hersh soil and 25 to 30 percent Valentine soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Hersh soil has a surface layer of grayish brown, very friable fine sandy loam about 5 inches thick. The transition layer is brown, very friable fine sandy loam about 6 inches thick. The upper part of the underlying material is pale brown loamy very fine sand. The lower part to a depth of more than 60 inches is very pale brown fine sand.

Typically, the Valentine soil has a surface layer of brown, very friable loamy fine sand about 4 inches thick. The transition layer is pale brown, very friable loamy fine sand about 4 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sand.

Included with these soils in mapping are small areas of Anselmo and Hobbs soils. Anselmo soils are in the less sloping areas on the concave lower side slopes. They have a thicker surface soil. Hobbs soils are on bottom land along drainageways. They are silty and stratified. Also included are small, steep and very steep areas of silty soils. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderately rapid in the Hersh soil and rapid in the Valentine soil. The available water capacity is moderate in the Hersh soil and low in the Valentine soil. The organic matter content is low in both soils. Runoff is medium on the Hersh soil and slow on the Valentine soil.

Nearly all of the acreage supports native grasses and is used for grazing. These soils are not suited to crops because of the slope and severe hazards of soil blowing and water erosion. They are best suited to range. The climax vegetation on the Hersh soil is dominantly prairie sandreed, sand bluestem, needleandthread, and little bluestem. These species make up 80 percent or more of the total annual forage on this soil. Blue grama, switchgrass, and forbs make up the rest. The climax vegetation on the Valentine soil is dominantly sand bluestem, little bluestem, switchgrass, prairie sandreed, and sand lovegrass. These species make up 65 percent or more of the total annual forage on this soil. Blue grama, needleandthread, sandhill muhly, sedges, forbs, and shrubs make up the rest.

If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, prairie sandreed, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. An overgrazed range site is subject to excessive soil blowing.

If the range is in excellent condition, the suggested initial stocking rate is about 0.9 animal unit month per acre on the Hersh soil and about 0.8 animal unit month per acre on the Valentine soil. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range.

These soils are generally not suited to the trees and shrubs grown as windbreaks. The slope prevents the use of conventional tree-planting and tillage equipment. Some areas can be used for the trees and shrubs that enhance recreation areas or wildlife habitat and for forestation plantings if suitable species are planted by hand or other special management is applied. Onsite investigation can identify small areas suitable for windbreaks.

The Hersh soil is limited as a site for septic tank absorption fields because of the slope. Land shaping and installing the distribution lines on the contour help to ensure that the absorption field functions properly. Where the slope is more than 15 percent, this soil is not suitable as a site for septic tank absorption fields. A

suitable alternative site is needed.

The Valentine soil is not suitable as a site for septic tank absorption fields. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water supplies.

These soils are limited as sites for dwellings. In areas of the Valentine soil, the sides of shallow excavations can cave in unless they are shored. On both soils, dwellings can be designed so that they conform to the natural slope of the land, or the site can be graded to a suitable gradient. Cutting and filling help to provide a suitable grade. Installing a surface drainage system minimizes damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability unit is VIe-3, dryland; windbreak suitability group 10. The Hersh soil is in the Sandy range site, and the Valentine soil is in the Sands range site.

Hk—Hobbs silt loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil formed in silty alluvium on bottom land. It is occasionally flooded. Areas are long and narrow and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The underlying material to a depth of more than 60 inches is stratified, dark grayish brown and grayish brown silt loam. In some places the underlying material has thin layers of silty clay loam, fine sandy loam, and very fine sandy loam. In other places carbonates are at the surface.

Included with this soil in mapping are small areas of Cozad and Hord soils. These soils are on the higher parts of the landscape and are subject to rare flooding. They are characterized by more profile development than the Hobbs soil. They make up about 5 to 10 percent of the map unit.

Permeability is moderate in the Hobbs soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water intake rate is moderate.

Most of the acreage of this soil is used for cultivated crops. Some areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. In some years tillage or planting are delayed by floodwater that occurs as spring runoff from the adjacent uplands. Silt deposited by the floodwater can damage newly seeded crops. Diversions and terraces on the adjacent uplands intercept the runoff and divert it from this soil. Applying the conservation measures needed on the adjacent soils helps to control runoff and flooding on this soil. Returning crop residue to the soil increases the organic matter content and improves fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is commonly farmed as part of a larger field. It is suited to gravity and sprinkler irrigation. Measures that control flooding are needed. Terraces, diversions, and a conservation tillage system, such as disc or chisel and plant, or no-till, that keep crop residue on the surface help to control water erosion and the runoff from adjacent soils. Grassed waterways also help to control erosion. Returning crop residue to the soil increases the organic matter content and improves fertility.

This soil is suited to pasture and hay. Orchardgrass, smooth bromegrass, big bluestem, switchgrass, and alfalfa are suitable. Deposition of silt and overgrazing reduce forage production. Proper stocking rates and rotation grazing can maintain or increase forage production. Introduced grasses respond well to applications of fertilizer and to irrigation. Delaying grazing in spring and after irrigation until the surface is firm helps to keep the pasture in good condition.

This soil is suited to range, either for grazing or haying. Overgrazing by livestock or improper haying methods deplete the protective cover and cause the native plants to deteriorate. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Good site preparation, timely cultivation, and timely applications of herbicide help to control the weeds and grasses that compete with the trees and shrubs for moisture.

This soil is not suited to use as a site for septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. Constructing roads on suitable, well compacted fill material above flood levels and providing adequate side ditches and culverts help to prevent road damage caused by flooding. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIw-3, dryland, and IIw-6, irrigated; Silty Overflow range site; windbreak suitability group 1.

HmB—Hobbs silt loam, channeled, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, well drained soil formed in silty alluvium on long and narrow bottom land cut by meandering stream channels. Areas include very steep streambanks or stream terrace escarpments. The soil is frequently flooded. Areas range from 10 to 200 acres in size.

Typically, the surface layer is stratified grayish brown and dark grayish brown, friable silt loam about 10 inches thick. The underlying material to a depth of more than 60 inches is stratified very dark grayish brown, dark grayish brown, grayish brown, and light brownish gray silt loam. In some places the underlying material is stratified with sandy or loamy material. In other places dark buried layers are common. In some areas carbonates are at the surface.

Included with this soil in mapping are areas of Coly, Cozad, and Hord soils. Coly soils are on uplands. They are calcareous at the surface. Cozad and Hord soils are on stream terraces. They are not stratified in the upper part. Also included are small areas of somewhat poorly drained soils along drainageways. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hobbs soil. The available water capacity is high. The organic matter content is moderate. Runoff is medium.

Nearly all of the acreage supports native grasses, trees, and shrubs and is used for grazing and as habitat for wildlife. This soil is generally not suited to dryland or irrigated crops or to pasture and hay because of the rough terrain, inaccessibility, and the frequent flooding.

This soil is suited to range. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. Proper grazing use, timely deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil generally is not suited to the trees and shrubs grown as windbreaks because of the meandering, entrenched stream channels and the frequent flooding. A few areas can be used for the trees and shrubs that enhance recreation areas or wildlife habitat if suitable species are planted by hand or other special management is applied.

This soil is not suitable as a site for septic tank absorption fields or dwellings because of the flooding. A suitable alternative site is needed. Constructing roads on suitable, well compacted fill material raises the roadway above flood levels. Establishing adequate side ditches and installing culverts help to prevent the road damage caused by flooding. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability unit is VIw-7, dryland; Silty Overflow range site; windbreak suitability group 10.

Ho—Holdrege silt loam, 0 to 1 percent slopes. This deep, nearly level, well drained soil formed in loess on uplands. Areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is similar in color and texture to the surface layer. It is about 5 inches thick. The subsoil is about 21 inches thick. The upper part is dark grayish brown and grayish brown, friable silty clay loam, and the lower part is pale brown, friable silt loam. The underlying material to a depth of more than 60 inches is pale brown and very pale brown, calcareous silt loam. In some places land grading operations have removed the surface soil and exposed the subsoil or the underlying material. In other places the surface soil is more than 20 inches thick.

Included with this soil in mapping are small areas of Hord and Scott soils. Hord soils are lower on the landscape than the Holdrege soil. Also, they have a thicker surface soil. Scott soils are in small depressions and are ponded after rains. They have more clay than the Holdrege soil. Included soils make up about 5 to 10 percent of the map unit.

Permeability is moderate in the Holdrege soil. The available water capacity is high. The organic matter content is moderate. Runoff is very slow. The water intake rate is moderately low. It is reduced in areas where the silty clay loam subsoil is exposed. Farming is more difficult in these areas than in the other areas.

Most of the acreage of this soil is used for cultivated crops grown under irrigation. A few small areas support grasses and are used as pasture or range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. In most years insufficient seasonal rainfall limits the production of dryland row crops and alfalfa. Soil blowing is a slight hazard unless crops or crop residue protect the surface. A conservation tillage system, such as chisel or disc and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil and adding barnyard manure increase the organic matter content, improve fertility and tilth, and increase the water intake rate.

If irrigated, this soil is suited to corn, alfalfa, grain sorghum, soybeans, and introduced grasses. It is suitable for gravity or sprinkler irrigation. Some land leveling is generally needed for gravity irrigation. A

conservation tillage system, such as chisel or disc and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil helps to maintain the organic matter content and improves fertility. It also helps to maintain tilth, loosens compacted soils, and increases the water intake rate. Applications of barnyard manure increase the organic matter content and improve fertility. The efficient use of irrigation water is a management concern. In areas where cuts made during land leveling have exposed the finer textured subsoil, applications of zinc and increased amounts of nitrogen and phosphorous fertilizer improve crop yields.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Continuous overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Separate pastures of cool- and warm-season grasses can provide forage throughout the grazing season. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Applications of fertilizer and irrigation can increase forage production.

This soil is suited to range. This use is effective in controlling soil blowing. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. Proper grazing use, timely deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Grasses and weeds compete with the trees and shrubs for soil moisture. Cultivating between tree rows with conventional equipment and applying the appropriate herbicides in the rows help to control the undesirable plants.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling of the soil. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIc-1, dryland, and I-4, irrigated; Silty range site; windbreak suitability group 3.

HoB—Holdrege silt loam, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil formed in loess on uplands. Areas range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is similar in color and texture to the surface layer. It is about 5 inches thick. The subsoil is about 20 inches thick. It is dark grayish brown and grayish brown, friable silty clay loam in the upper part and light brownish gray, friable silt loam in the lower part. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam. In some places the surface soil is more than 20 inches thick. In other places land grading operations have removed the surface soil and subsoil and exposed the underlying material.

Included with this soil in mapping are small areas of Uly soils. These soils have less clay in the subsoil than the Holdrege soil. Also, they are on steeper slopes. They make up 5 to 10 percent of the map unit.

Permeability is moderate in the Holdrege soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water intake rate is moderately low.

Most of the acreage of this soil is used as cropland. Much of the cropland is irrigated. Some areas support grasses and are used as pasture or range.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, soybeans, and alfalfa. In most years insufficient seasonal rainfall limits dryland crop production. Soil blowing and water erosion are slight hazards unless crops or crop residue protects the surface. A conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control soil blowing and water erosion and conserves moisture. Terraces, contour farming, and grassed waterways help to control water erosion. Returning crop residue to the soil and adding barnyard manure increase the organic matter content, improve fertility and tilth, and increase the water intake rate.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suitable for gravity or sprinkler irrigation. The efficient use of irrigation water is a management concern. In places land leveling is generally needed for gravity irrigation. Adjusting the row direction of the crop to the slope helps to control erosion and improves the distribution of irrigation water. Contour bench leveling helps to establish nonerodible grades and allows for the efficient use of irrigation water. Tailwater recovery systems can be used to collect runoff of irrigation water. This water can be stored for later use. Adding zinc and organic

material improves fertility and tilth in areas that have been leveled. Sprinkler irrigation systems require less land preparation than gravity systems. Adjusting the rate of water application to the intake rate of the soil helps to control runoff and erosion. A conservation tillage system, such as chisel or disc and plant, or till-plant, that keeps crop residue on the surface helps to control soil blowing and water erosion.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Continuous overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and increases the runoff rate and the susceptibility to water erosion. Separate pastures of cool- and warm-season grasses can provide forage throughout the grazing season. Rotation grazing and proper stocking rates help to keep the pasture in good condition. The plants respond well to applications of irrigation water and fertilizer.

This soil is suited to range. This use is very effective in controlling soil blowing and water erosion. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. It can also result in water erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Weeds and grasses compete with the trees for soil moisture. Cultivating with conventional equipment between the tree rows or applying the appropriate herbicides in the rows helps to control the undesirable plants.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling of the soil. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser base material helps to ensure better performance.

The land capability units are IIe-1, dryland, and IIe-4, irrigated; Silty range site; windbreak suitability group 3.

HoC—Holdrege silt loam, 3 to 6 percent slopes. This deep, gently sloping, well drained soil formed in loess on uplands. It is on convex side slopes and ridgetops. Areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 16 inches thick. The upper part is dark grayish brown and grayish brown, friable silty clay loam, and the lower part is light brownish gray, friable silt loam. The underlying material to a depth of more than 60 inches is pale brown and very pale brown silt loam. Carbonates are at a depth of about 32 inches.

Included with this soil in mapping are small areas of Coly and Uly soils on the steeper side slopes. These soils contain less clay than the Holdrege soil. They make up about 5 to 10 percent of the map unit.

Permeability is moderate in the Holdrege soil. The available water capacity is high. The organic matter content is moderate. Runoff is medium. The water intake rate is moderately low.

Most areas of this soil support native grasses and are used as range. Most areas of cropland are used for dryland crops.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, and alfalfa. Water erosion and soil blowing are hazards unless crops or crop residue adequately protects the surface. A conservation tillage system, such as chisel or disc and plant, or no-till, that keeps crop residue on the surface helps to control water erosion and soil blowing. Including close-growing crops in the cropping system helps to control water erosion. Terraces and contour farming help to control runoff and water erosion. Returning crop residue and green manure crops to the soil increases the organic matter content, improves tilth and fertility, increases the rate of water infiltration, and conserves moisture.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. It cannot be irrigated by a gravity system unless contour bench leveling reduces the slope to a nonerodible grade. The soil is best suited to sprinkler irrigation. Adjusting the water application rate to the water intake rate of the soil helps to control runoff and water erosion. A conservation tillage system, such as chisel or disc and plant, or no-till, that leaves crop residue on the surface helps to control water erosion and soil blowing. Terraces and grassed waterways also help to control water erosion.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops in the cropping system. Continuous overgrazing or untimely haying causes plants to lose vigor. If overgrazing continues for many years, the plants are unable to stabilize the site and water erosion is a hazard. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition. Applications of fertilizer and irrigation

water increase forage production.

This soil is suited to range. This use is effective in controlling soil blowing and water erosion. Overgrazing by livestock depletes the protective cover and causes deterioration of the native plants. It also can result in water erosion. Proper grazing use, timely deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Planting on the contour and terracing help to control water erosion. Cultivation with conventional equipment between the tree rows or strips of sod or other vegetation between the rows help to control soil blowing and water erosion. Timely applications of the appropriate herbicides in the rows help to control undesirable weeds and grasses.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling of the soil. The design of the building can accommodate the slope. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIIe-1, dryland, and IIIe-4, irrigated; Silty range site; windbreak suitability group 3.

HpC2—Holdrege silty clay loam, 3 to 6 percent slopes, eroded. This deep, gently sloping, well drained soil formed in loess on uplands. It is on ridgetops and the convex upper side slopes. Much of the original, dark surface layer has been eroded away, and the remaining surface layer has been mixed with the upper part of the subsoil by tillage. The present surface layer is sticky when wet and hard and cloddy when dry. In some areas calcareous underlying material is at the surface. In areas without an adequate plant cover, rills and small gullies form during medium-intensity rains. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 5 inches thick. The subsoil is about 14 inches thick. It is grayish brown, friable silty clay loam in the upper part and light brownish gray, friable silt loam in the lower part. The underlying material to a depth of more than 60 inches is light gray silt loam. It is calcareous at a depth of about 28 inches.

Included with this soil in mapping are small areas of Coly and Uly soils on the steeper slopes. These soils have less clay throughout than the Holdrege soil. Coly soils have carbonates at or near the surface. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Holdrege soil. The available water capacity is high. The organic matter content is moderately low. Runoff is medium. The water intake rate is moderately low.

Most of the acreage of this soil is used for dryland crops. A few areas are irrigated. Some areas formerly used as cropland have been seeded to grasses and are used as pasture or range.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, and alfalfa. Water erosion is a severe hazard. A conservation tillage system, such as disc or chisel and plant, or no-till, that keeps crop residue on the surface helps to control water erosion. Including close-growing crops in the cropping system also helps to control water erosion. Terraces and contour farming help to control runoff and water erosion. Returning crop residue and green manure crops to the soil increases the organic matter content. It also improves tilth and fertility. Applications of herbicide should be adjusted in areas where the content of organic matter is low.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. It is not suited to gravity irrigation unless contour bench leveling reduces the slope to a nonerodible grade. Sprinkler systems are the best suited methods of irrigation (fig. 7). A conservation tillage system, such as disc or chisel and plant, that keeps crop residue on the surface helps to control water erosion (fig. 8). Terraces and contour farming help to control runoff and water erosion. Adjusting the rate of water application to the water intake rate of the soil also helps to control runoff and water erosion.

This soil is suited to hay and pasture. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops in the cropping system. Continuous overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Separate pastures of cool-season grasses and warm-season grasses provide green forage throughout the growing season. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Introduced grasses and legumes respond well to applications of fertilizer and to irrigation.

This soil is suited to range. This use is effective in controlling soil blowing and water erosion. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. It also can result in severe water erosion. Proper grazing use, timely

Figure 7.—Corn in an area of Holdrege silty clay loam, 3 to 6 percent slopes, eroded. This area is irrigated by a towline sprinkler system.

deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Cover crops should be planted between the tree rows. Planting the trees on the contour and terracing help to control runoff and water erosion. Timely cultivation with conventional equipment between the tree rows and timely applications of the appropriate herbicides in the rows help to control the undesirable grasses and weeds that compete with the trees for moisture.

This soil is generally suited to use as a site for septic tank absorption fields. Strengthening the foundations of buildings and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling of the soil. The design of the building can accommodate the slope, or the site can be graded to an acceptable gradient. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIIe-8, dryland, and IIIe-4, irrigated; Silty range site; windbreak suitability group 3.

Ht—Hord silt loam, terrace, 0 to 1 percent slopes. This deep, nearly level, well drained soil formed in silty

alluvium and colluvium on stream terraces. It is subject to rare flooding. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is similar in color and texture to the surface layer. It is about 8 inches thick. The subsoil is friable silt loam about 20 inches thick. It is dark grayish brown in the upper part and grayish brown in the lower part. The underlying material to a depth of more than 60 inches is pale brown, calcareous silt loam. In some places the depth to carbonates is more than 48 inches. In other places buried soils are below a depth of 40 inches.

Included with this soil in mapping are small areas of Cozad, Hall, and Hobbs soils. Cozad soils are slightly higher on the landscape than the Hord soil. Their dark surface soil is less than 20 inches thick. Hall soils are in landscape positions similar to those of the Hord soil. They have more clay in the subsoil than the Hord soil. Hobbs soils are lower on the landscape than the Hord soil and are stratified. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hord soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water intake rate is moderate. Tilth is good.

Figure 8.—A protective cover of crop residue in an area of Holdrege silty clay loam, 3 to 6 percent slopes, eroded.

Most of the acreage of this soil is used as irrigated cropland. Some areas are used for dryland crops. A few small areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, small grain, grain sorghum, soybeans, and alfalfa. In most years insufficient seasonal rainfall limits crop production. Soil blowing is a slight hazard unless crops or crop residue protects the surface. A conservation tillage system, such as stubble mulching, or chisel or disc and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil and adding barnyard manure increase the organic matter content and improve tilth and fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suited to gravity and sprinkler irrigation. The efficient use of irrigation water is a management concern. A conservation tillage system, such as disc or chisel and plant, that keeps crop residue on the surface helps to control soil blowing. Returning crop residue to the soil increases the organic matter content and improves tilth and fertility.

This soil is suited to pasture or hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Separate pastures of cool-season grasses and warm-season grasses can provide green forage throughout the growing season. Continuous overgrazing causes the plants to lose vigor and reduces forage production. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Introduced grasses and legumes respond well to applications of irrigation water and fertilizer.

This soil is suited to range. This use is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Grasses and weeds compete with the trees for soil moisture. Applying the appropriate herbicides at the proper time in the tree rows and cultivating between the rows with conventional equipment help to control the undesirable plants.

Septic tank absorption fields function well on this soil if the sites are protected from floodwater. Constructing dwellings on raised, well compacted fill material helps to prevent the structural damage caused by floodwater. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIc-1, dryland, and I-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

HtB—Hord silt loam, terrace, 1 to 3 percent slopes. This deep, very gently sloping, well drained soil formed in silty alluvium and colluvium on stream terraces. Areas range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is friable silt loam about 9 inches thick. It is very dark grayish brown in the upper part and dark grayish brown in the lower part. The subsoil is friable silt loam about 18 inches thick. The upper part is dark grayish brown, and the lower part is grayish brown. The underlying material to a depth of more than 60 inches is light brownish gray, calcareous silt loam. In some places the surface layer is light colored. In other places the subsoil is silty clay loam. In some areas carbonates are at a depth of more than 48 inches.

Included with this soil in mapping are small areas of Cozad and Hobbs soils. Cozad soils are in landscape positions similar to those of the Hord soil. Their dark surface layer is thinner than that of the Hord soil. Hobbs soils are lower on the landscape than the Hord soil and are stratified. Included soils make up 5 to 15 percent of the map unit.

Permeability is moderate in the Hord soil. The available water capacity is high. The organic matter content is moderate. Runoff is slow. The water intake rate is moderate. Tilth is good.

Nearly all of the acreage of this soil is used as cropland. Most of the cropland is irrigated. A few small areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. Water erosion and soil blowing are slight hazards unless crops or crop residue adequately protect the surface. A conservation tillage system, such as chisel or disc and plant, that keeps crop residue on the surface helps to control erosion and conserves moisture. Terraces, contour farming, and grassed waterways help to control erosion. Returning crop residue to the soil and applying barnyard manure increase the organic matter content and improve fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is suited to gravity and sprinkler irrigation. Water erosion is a hazard. A conservation tillage system, such as chisel or disc and plant, or till-plant, that keeps crop residue on the surface helps to control water erosion and soil blowing. Returning crop residue to the soil and applying barnyard manure increase the organic matter content and improve fertility. Some land leveling is needed for gravity irrigation. The efficient use of irrigation water and control of runoff are management concerns. A tailwater recovery system can be used to collect irrigation runoff and to store water for later use.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, trefoil, switchgrass, and big bluestem are suitable. They can be alternated with other crops in the cropping system. Continuous overgrazing causes the plants to lose vigor. If overgrazing continues for several years, the plants are unable to stabilize the site and water erosion is a hazard. Separate pastures of cool- and warm-season grasses can provide green forage throughout the grazing season. Rotation grazing and proper stocking rates help to keep the pasture in good condition.

This soil is suited to range. This use is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause deterioration of the native plants. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Weeds and grasses compete with the trees for soil moisture. Cultivating with conventional equipment between the tree rows and rototilling and carefully applying the appropriate herbicides at the proper time in the rows help to control the undesirable weeds and grasses.

This soil is generally suited to use as a site for septic tank absorption fields and dwellings. Local roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IIe-1, dryland, and IIe-6, irrigated; Silty Lowland range site; windbreak suitability group 1.

IpB—Ipage loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil formed in sandy eolian and alluvial material on stream terraces. Areas range from 20 to 300 acres in size.

Typically, the surface layer is dark grayish brown loamy fine sand about 6 inches thick. The transition layer is grayish brown, loose loamy fine sand about 6 inches thick. The underlying material to a depth of more than 60 inches is very pale brown, light gray, and white fine sand. Mottles are below a depth of 35 inches. In some places the surface layer is fine sandy loam, loamy sand, or fine sand. In other places coarse sand and fine gravel are in the lower part of the profile.

Included with this soil in mapping are small areas of Hersh, Libory, and Valentine soils. Hersh soils are higher on the landscape than the Ipage soil. Also, they are finer textured. Libory soils are in landscape positions similar to those of the Ipage soil. They have silty underlying material. Valentine soils are higher on the landscape than the Ipage soil and are excessively drained. Included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the Ipage soil. The available water capacity is low. The organic matter content also is low. Runoff is very slow. The seasonal high water table ranges from a depth of about 3 feet in wet years to about 6 feet in dry years. The water intake rate is very high.

Most of the acreage of this soil supports native grasses and is used as range. A few areas are used for cultivated crops grown under sprinkler irrigation.

If used for dryland farming, this soil is poorly suited to corn, small grain, grain sorghum, and alfalfa. Small grain and the first cutting of alfalfa are better suited than other crops because they grow and mature in spring, when rainfall is more abundant. Soil blowing is a hazard. A cropping system that keeps the surface covered with crops, grass, or crop residue helps to control soil blowing, conserves moisture, and helps to maintain fertility.

If irrigated, this soil is suited to corn, grain sorghum, alfalfa, and introduced grasses. Sprinkler irrigation is the only suitable irrigation system on this soil. The soil is not suited to gravity irrigation because of the very high water intake rate. Light and frequent applications of irrigation water meet the needs of the crop without leaching plant nutrients below the root zone. Soil blowing is a severe hazard unless crops or crop residue protects the surface. A conservation tillage system, such as disc or chisel and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue and green manure crops to the soil increases the organic matter content and improves fertility.

This soil is suited to pasture and hay. Smooth bromegrass, intermediate wheatgrass, alfalfa, switchgrass, and big bluestem are suitable. Proper stocking rates and rotation grazing can maintain or increase forage production and help to control soil blowing. Applications of irrigation water and fertilizer also increase forage production.

In areas of this soil used for range or native hay, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, needleandthread, and switchgrass. These species make up 55 percent or more of the total annual forage. Blue grama, prairie junegrass, Kentucky bluegrass, indiangrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, indiangrass, little bluestem, and switchgrass decrease in abundance and are replaced by prairie sandreed, needleandthread, sand dropseed, blue grama, sedges, and forbs. If overgrazing continues for many years, blue grama, sand dropseed, needleandthread, Scribner panicum, sedges, and forbs dominate the site. Under these conditions, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is 1.0 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range.

If this soil is used as hayland, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range. Regulating mowing maintains a vigorous stand of healthy grasses.

This soil is suited to the trees and shrubs grown as windbreaks. Drip irrigation can provide moisture during dry periods. Maintaining strips of sod or cover crops between the tree rows helps to control soil blowing. Weeds and grasses in the tree rows compete with the trees and shrubs for soil moisture. Cultivating with conventional equipment and applying carefully selected herbicides at the proper time help to control the undesirable plants.

This soil is severely limited as a site for septic tank absorption fields because of seepage and the seasonal high water table. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water supplies. Constructing the absorption fields on fill material, which raises them a sufficient distance above the water table, helps to ensure proper performance. The sides of shallow excavations can cave in unless they are shored. Constructing dwellings with basements on raised, well compacted fill material increases the depth to the seasonal high water table. Installing a surface drainage system and a gravel moisture barrier in the subgrade minimizes the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IVe-5, dryland, and IVe-11, irrigated; Sandy Lowland range site; windbreak suitability group 5.

LbB—Libory loamy fine sand, 0 to 3 percent slopes. This deep, nearly level and very gently sloping, moderately well drained soil formed in sandy eolian material deposited on silty alluvium. It is on stream terraces. Areas range from 10 to 400 acres in size.

Typically, the surface layer is grayish brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is dark grayish brown, very friable loamy fine sand about 6 inches thick. The subsoil is about 31 inches thick. It is light brownish gray and light gray, mottled, loose fine sand in the upper part and grayish brown, mottled, friable silty clay loam in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam. In some places the surface layer is fine sandy loam. In other places it is light colored.

Included with this soil in mapping are small areas of Boel and Ipage soils. Boel soils are lower on the landscape than the Libory soil and are somewhat poorly drained. Ipage soils are in landscape positions similar to those of the Libory soil. They are sandy throughout. Included soils make up 10 to 15 percent of the map unit.

Permeability is rapid in the sandy upper part of the Libory soil and moderate in the silty lower part. The available water capacity is moderate. The organic matter content is moderately low. Runoff is slow. The water intake rate is high. A water table is perched for a short time above the underlying material in spring and during wet periods. Depth to the perched water table ranges from 1.5 feet in wet years to 3.5 feet in dry years.

Most of the acreage of this soil is used as cropland. A large part of the cropland is irrigated. Some areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn,

small grain, grain sorghum, soybeans, and alfalfa. Wheat and alfalfa are more dependable crops because they grow and mature in spring, when rainfall is more abundant. Soil blowing is a hazard. A conservation tillage system, such as stubble mulching or no-till, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. The silty underlying material holds moisture that helps to sustain deep-rooted crops during periods of low rainfall. Returning crop residue to the soil and applying barnyard manure increase the organic matter content and improve fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is best suited to sprinkler irrigation systems. Soil blowing is a hazard unless crops or crop residue protects the surface. A conservation tillage system, such as chisel or disc and plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content and improves fertility.

This soil is suited to pasture and hay. Smooth bromegrass, alfalfa, switchgrass, and big bluestem are suitable. They can be alternated with other crops as part of the cropping system. Continuous overgrazing depletes the protective cover and causes deterioration of the plants. If overgrazing continues for many years, the plants are unable to stabilize the site and soil blowing is a hazard. Rotation grazing and proper stocking rates help to keep the grasses in good condition. Applications of fertilizer and irrigation water increase forage production.

This soil is suited to range. This use is effective in controlling soil blowing. Overgrazing by livestock or improper haying methods deplete the protective cover and cause deterioration of the native plants. Overgrazing also can result in soil blowing. Proper grazing use, timely deferment of grazing or haying, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Maintaining strips of sod or other vegetation between the tree rows helps to control soil blowing. Weeds and grasses compete with the trees and shrubs for soil moisture. Cultivating with conventional equipment or applying the appropriate herbicides helps to control the undesirable plants.

This soil is severely limited as a site for septic tank absorption fields because of seepage and the seasonal high water table. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water supplies. The absorption fields can be constructed on fill material, which raises them a sufficient distance above the seasonal high water table. The sides of shallow excavations can cave in unless they are shored. They should be shored during a dry period. Constructing dwellings on raised, well compacted fill material helps to overcome the wetness caused by the seasonal high water table. Constructing roads on suitable, well compacted fill material and providing adequate side ditches and culverts help to prevent the road damage caused by wetness.

The land capability units are IIIe-6, dryland, and IIIe-10, irrigated; Sandy Lowland range site; windbreak suitability group 5.

Lo—Loup fine sandy loam, 0 to 2 percent slopes. This deep, nearly level, poorly drained soil formed in loamy and sandy alluvium on bottom land. It is subject to rare flooding. Areas are long and narrow and range from 5 to 200 acres in size.

Typically, the surface layer is dark gray, very friable, calcareous fine sandy loam about 5 inches thick. The subsurface layer is very dark gray, mottled, very friable, calcareous fine sandy loam about 5 inches thick. The underlying material to a depth of more than 60 inches is mottled fine sand. It is light gray in the upper part and white in the lower part. In some places the surface layer is loam, silt loam, or loamy fine sand. In other places the underlying material has strata of loam, very fine sandy loam, and fine sandy loam.

Included with this soil in mapping are small areas of Barney and Bolent soils. Barney soils are lower on the landscape than the Loup soil, are stratified, and are frequently flooded. Bolent soils are higher on the landscape than the Loup soil and are somewhat poorly drained. Included soils make up 5 to 15 percent of the map unit.

Permeability is rapid in the Loup soil. The available water capacity is low. The organic matter content is high. Runoff is very slow. The seasonal high water table is at the surface in most wet years and within a depth of 1.5 feet in most dry years.

Nearly all of the acreage supports native grasses and is used as range or hayland. This soil is not suitable for use as cropland because of the seasonal high water table. The climax vegetation is dominantly big bluestem, indiangrass, prairie cordgrass, switchgrass, sedges, and rushes. These species make up 70 percent or more of the total annual forage. Bluegrass, northern reedgrass, bluejoint reedgrass, slender wheatgrass, and forbs make up the rest. If subject to continuous heavy grazing

or improperly harvested for hay, big bluestem, prairie cordgrass, switchgrass, and indiangrass decrease in abundance and are replaced by slender wheatgrass, western wheatgrass, plains muhly, and sedges. Timothy, redtop, and red clover increase in abundance if they have been overseeded. If overgrazing or improper haying methods continue for many years, bluegrass, western wheatgrass, sedges, rushes, and forbs dominate the site. When the surface is wet, overgrazing and heavy machinery traffic cause surface compaction and the formation of small mounds and ruts, which make grazing or harvesting for hay difficult.

If the range is in excellent condition, the suggested initial stocking rate is 1.9 animal unit months per acre. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during very wet periods helps to maintain or improve the range condition. This soil is generally the first to be overgrazed when it is grazed in conjunction with better drained, sandy soils. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing.

If this soil is used as hayland, regulating mowing helps to maintain a vigorous stand of grasses. Large meadows can be divided into three sections, which can be mowed in rotation. Changing the order in which the sections are mowed in successive years helps to maintain vigorous grasses. After the ground is frozen, livestock can graze without damaging the meadows. They should be removed in spring, before the ground thaws and the water table reaches a high level.

This soil is suited to the trees and shrubs grown as windbreaks. The only suitable species are those that are water tolerant. Site preparation and planting may not be possible until the water table drops and the soil is sufficiently dry. Weeds and grasses compete with the trees and shrubs for soil moisture. Cultivating between the tree rows when the water table is at its lowest level helps to control the undesirable plants.

This soil is not suited to use as a site for septic tank absorption fields or dwellings because of the seasonal high water table, seepage, and flooding. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the underground water supplies. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. They should be shored during a dry period. Constructing roads on suitable, well compacted fill material above flood levels, providing adequate side ditches, and installing culverts help to prevent the road damage caused by wetness.

The land capability unit is Vw-7, dryland; Wet Subirrigated range site; windbreak suitability group 2D.

Lp—Loup loam, wet, 0 to 2 percent slopes. This deep, nearly level, very poorly drained soil formed in loamy and sandy alluvium on bottom land. It is subject to rare flooding and to occasional ponding by a high water table. Areas are adjacent to the river. They range from 5 to 100 acres in size.

Typically, the surface layer is dark gray, mottled, very friable, calcareous loam about 10 inches thick. The transition layer is gray, mottled, very friable, calcareous loam about 3 inches thick. The underlying material to a depth of more than 60 inches is light gray, mottled fine sand. In some places a thin layer of partly decomposed organic matter is on the surface. In other places the underlying material has loamy strata.

Included with this soil in mapping are small areas of Barney soils and of sandy Fluvaquents. Barney soils are lower on the landscape than the Loup soil, are frequently flooded, and are poorly drained. The Fluvaquents are in the lowest positions on the bottom land and are frequently flooded. Included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the Loup soil. The available water capacity is low. The organic matter content is high. Runoff is very slow. The seasonal high water table ranges from about 0.5 foot above the surface in wet years to about 1 foot below the surface in dry years.

Nearly all areas of this soil support native grasses and are used as range or hayland. A few small areas provide habitat for wetland wildlife. This soil is not suited to crops because of the seasonal high water table.

The climax vegetation on this soil is dominantly prairie cordgrass, bluejoint reedgrass, northern reedgrass, and sedges. These species make up 80 percent or more of the total annual forage. Slender wheatgrass, rushes, and forbs make up the rest. If subject to continuous heavy grazing or improperly harvested for hay, prairie cordgrass, bluejoint reedgrass, and northern reedgrass decrease in abundance and are replaced by slender wheatgrass, bluegrass, green muhly, sedges, rushes, and forbs. If overgrazing or improper haying methods continue for many years, bluegrass, foxtail barley, sedges, rushes, and forbs dominate the site. When the surface is wet, overgrazing and heavy machinery traffic can cause surface compaction and the formation of small mounds and ruts, which make grazing or harvesting for hay difficult.

In most areas the range is in good condition. The suggested initial stocking rate is about 1.5 animal unit

months per acre. This soil produces a high quantity of low-quality forage. A planned grazing system that includes proper grazing use, timely deferment of grazing and haying, and restricted use during very wet periods helps to maintain or improve the range condition.

If this soil is used as hayland, regulating mowing allows the grasses to remain vigorous and healthy. Some areas that are too wet cannot be harvested in some years. After the ground is frozen, grazing livestock do not damage the meadows. They should be removed in spring, before the ground thaws and the water table reaches a high level.

This soil is not suited to the trees and shrubs grown as windbreaks. A few areas can be used for the trees and shrubs that enhance recreation areas or wildlife habitat or for forestation plantings if suitable species are hand planted or other special management is applied.

This soil is not suited to use as a site for septic tank absorption fields or dwellings because of the seasonal high water table and the flooding. A suitable alternative site is needed. The sides of shallow excavations can cave in unless they are shored. They should be shored during a dry period. Constructing roads on suitable, well compacted fill material above the level of ponding and providing adequate side ditches and culverts help to prevent the damage caused by ponding and flooding.

The land capability unit is Vw-7, dryland; Wetland range site; windbreak suitability group 10.

RsB—Ronson fine sandy loam, 0 to 3 percent slopes. This moderately deep, very gently sloping, well drained soil formed in loamy material over calcareous sandstone. It is on stream terraces. Areas range from 10 to 70 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 8 inches thick. The transition layer is light brownish gray, very friable, calcareous sandy loam about 8 inches thick. The underlying material is about 11 inches of white and light gray, calcareous sandy loam that has fragments of sandstone. White, calcareous sandstone is at a depth of about 27 inches. It extends to a depth of more than 60 inches. In some places the surface layer is loam or silt loam. In other places the sandstone bedrock is within a depth of 20 inches. In some areas the sandstone crops out on the short, steeper slopes along the stream terrace breaks. In places the bedded sandstone is extremely hard.

Included with this soil in mapping are small areas of Anselmo, Cozad, and Ipage soils. Anselmo and Cozad soils are in landscape positions similar to those of the Ronson soil. They do not have bedrock within a depth of 40 inches. Cozad soils are silty. Ipage soils are slightly higher on the landscape than the Ronson soil. They are sandy. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderately rapid in the Ronson soil. The available water capacity is low. The organic matter content is moderately low. Runoff is slow. The water intake rate is moderately high.

Most of the acreage of this soil is used as irrigated cropland. A small acreage supports native grasses and is used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. The soil is droughty, and soil blowing is a hazard. A conservation tillage system, such as no-till, or chisel or disc and plant, that keeps crop residue on the surface conserves soil moisture and helps to control soil blowing. A cropping system that includes grasses and legumes increases the organic matter content and improves fertility.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. It is best suited to sprinkler irrigation. Cuts made during land leveling should not expose the underlying sandstone. A conservation tillage system, such as no-till or till-plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. A cropping system that includes grasses and legumes increases the organic matter content and improves fertility.

This soil is suited to hay and pasture. Smooth bromegrass, orchardgrass, alfalfa, and switchgrass are suitable. They can be alternated with other crops in the cropping system. Continuous overgrazing depletes the protective cover and causes deterioration of the plants. Rotation grazing and proper stocking rates help to keep the pasture in good condition. Applications of irrigation water and fertilizer can increase forage production.

This soil is suited to range. This use is effective in controlling soil blowing. Overgrazing by livestock depletes the protective cover and causes deterioration of the native plants. It also can cause soil blowing. Proper grazing use, timely deferment of grazing, and a planned grazing system help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. Drip irrigation can be used to supply additional water as needed. Grasses and weeds compete with the trees for soil moisture. Cultivating with conventional equipment between the tree rows and applying appropriate herbicides at the proper time in the rows help to control the undesirable plants.

This soil has severe limitations if used as a site for septic tank absorption fields and slight limitations if used as a site for dwellings. Building up or mounding the absorption fields with suitable fill material improves the filtering capacity of the fields. The soft bedrock generally can be excavated on sites for houses with basements or buildings that have deep footings. Installing a surface drainage system minimizes the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IIIe-3, dryland, and IIIe-9, irrigated; Sandy range site; windbreak suitability group 6R.

Sc—Scott silty clay loam, 0 to 1 percent slopes. This deep, nearly level, very poorly drained soil formed in loess in upland depressions. It is commonly ponded following heavy rains. Areas range from 5 to 180 acres in size.

Typically, the surface layer is dark gray and very dark gray, friable silty clay loam about 13 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is very firm silty clay about 24 inches thick. It is very dark gray in the upper part and dark gray in the lower part. The underlying material to a depth of more than 60 inches is silty clay loam. It is dark grayish brown in the upper part and very dark gray in the lower part.

Included with this soil in mapping are small areas of Hobbs and Hord soils. These soils are higher on the landscape than the Scott soil. Hobbs soils are stratified. They are occasionally flooded. Hord soils are silty. Included soils make up 5 to 10 percent of the map unit.

Permeability is very slow in the Scott soil. The available water capacity is high. The organic matter content is moderate. Runoff is ponded. The seasonal high water table is perched above the clayey subsoil during wet periods. It ranges from about 6 inches above the surface to about 1 foot below. The subsoil is very hard when dry and very sticky when wet.

Most of the acreage of this soil is idle land or is used as pasture or range. The vegetation is dominantly smartweed, sedges, and other aquatic grasses and weeds that provide good habitat for wildlife.

If used for dryland farming, this soil is poorly suited to cultivated crops because of the hazard of ponding. The excessive wetness damages corn and grain sorghum. Seed emergence is difficult because of a poor seedbed. Ponding early in spring and lodging during wet harvest periods often destroy wheat stands. Severe crop losses occur in about 7 years out of 10. Because of the excessive wetness, competition from weeds is a problem and timely cultivation is difficult. Good seedbed preparation is difficult, and poor seedling emergence and poor stands are common. Working the soil when it is too wet causes surface compaction and a poor seedbed. Freezing and thawing action in winter improves tilth and decreases the risk of compaction in areas that are tilled in the fall. Returning crop residue to the soil increases the organic matter content and improves fertility. The hazard of ponding can be reduced by constructing terraces and by applying good crop residue management practices on the adjacent sloping soils.

This soil is not suited to irrigated crops or to hay and pasture, range, or windbreaks. The ponding is the main hazard.

This soil is not suitable as a site for septic tank absorption fields or dwellings because of the ponding and the very slow permeability. Suitable alternative sites are needed. Constructing roads on suitable, well compacted fill material above the level of ponding and providing adequate side ditches and culverts help to prevent the road damage caused by ponding. A good surface drainage system can minimize the damage to roads caused by frost action. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability unit is IVw-2, dryland; windbreak suitability group 10. No range site is assigned.

UbD—Uly silt loam, 6 to 11 percent slopes. This deep, well drained, strongly sloping soil formed in loess on side slopes and ridgetops. Areas range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 11 inches thick. The subsoil is friable silt loam about 10 inches thick. It is dark grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of more than 60 inches is very pale brown, calcareous silt loam. In places the subsoil is silty clay loam.

Included with this soil in mapping are small areas of Coly and Holdrege soils. Coly soils are in landscape positions similar to those of the Uly soil. They are calcareous at or near the surface. Holdrege soils are on ridgetops and the lower side slopes. They have more clay in the subsoil than the Uly soil. Included soils make up 5 to 20 percent of the map unit.

Permeability is moderate in the Uly soil. The available water capacity is high. The organic matter content is moderate. Runoff is medium or rapid. The water intake rate is moderate.

Almost all of the acreage of this soil supports native grasses and is used as range. A few areas are used as cropland.

If used for dryland farming, this soil is poorly suited to corn, grain sorghum, small grain, and alfalfa. Water erosion is a severe hazard unless crops or crop residue adequately protect the surface. A system of conservation tillage, such as disc or chisel and plant, that keeps crop residue on the surface helps to control water erosion and conserves moisture. Terraces, grassed waterways, and contour farming help to control water erosion. Returning crop residue and green manure crops to the soil increases the organic matter content and improves fertility.

If irrigated, this soil is poorly suited to corn and grain sorghum. It is better suited to introduced grasses and alfalfa. It is not suited to gravity irrigation because of the slope. Sprinkler systems are suitable if careful management is applied. Wheel-track erosion can be a problem if center-pivot systems are used. Adjusting the rate of water application to the moderate intake rate of the soil helps to control runoff and water erosion. A system of conservation tillage, such as disc or chisel and plant, that keeps crop residue on the surface helps to control erosion and conserves moisture. Limiting the use of row crops in the cropping system and making maximum use of alfalfa and grasses help to control runoff and water erosion. Terraces, contour farming, and grassed waterways help to control water erosion.

This soil is suited to pasture and hay. Smooth bromegrass, orchardgrass, alfalfa, switchgrass, and big bluestem are suitable. Proper stocking rates and rotation grazing increase forage production and help to control water erosion. Introduced grasses and legumes respond well to applications of fertilizer and to sprinkler irrigation.

In areas of this soil used as range, the climax vegetation is dominantly big bluestem, little bluestem, sideoats grama, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Blue grama, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, needleandthread, sideoats grama, western wheatgrass, sedges, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing.

Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is seeded.

This soil is suited to the trees and shrubs grown as windbreaks. Irrigation is needed during dry periods. Planting the trees on the contour and terracing help to control water erosion. Maintaining strips of sod or other vegetation between the tree rows also helps to control water erosion. Good site preparation, timely cultivation, and timely applications of approved herbicides help to control the weeds and grasses that compete with the trees and shrubs for moisture.

If this soil is used as a site for septic tank absorption fields, land shaping and installing the distribution lines on the contour help to ensure the absorption system functions properly. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance.

The land capability units are IVe-1, dryland, and IVe-6, irrigated; Silty range site; windbreak suitability group 3.

UbE—Uly silt loam, 11 to 17 percent slopes. This deep, well drained, moderately steep soil formed in loess on side slopes and ridgetops. Areas range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil also is friable silt loam about 10 inches thick. It is grayish brown in the upper part and light brownish gray in the lower part. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Included with this soil in mapping are small areas of Coly and Hobbs soils. Coly soils are on ridgetops and the upper side slopes. They have carbonates at or near the surface. Hobbs soils are on bottom land and are stratified. Included soils make up 10 to 15 percent of the map unit.

Permeability is moderate in the Uly soil. The available water capacity is high. The organic matter content is moderate. Runoff is rapid.

Nearly all of the acreage supports native grasses and is used as range. A few areas are used for cultivated crops. This soil is generally not suited to crops because water erosion is a severe hazard.

In the areas of this soil used as range, the climax vegetation is dominantly big bluestem, little bluestem, sideoats grama, and western wheatgrass. These species make up 70 percent or more of the total annual forage. Blue grama, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, needleandthread, sideoats grama, western wheatgrass, sedges, and forbs. If overgrazing continues for many years, the native grasses lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing.

Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range. In areas where gullies have formed because of severe water erosion, land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is seeded.

This soil is suited to the trees and shrubs grown as windbreaks. Weeds and grasses that compete with the trees for moisture can be controlled by cultivating with conventional equipment and by applying appropriate herbicides. Irrigation is needed during dry periods. Planting on the contour and terracing help to control water erosion. Maintaining strips of sod or cover crops between the tree rows also helps to control water erosion.

If this soil is used as a site for septic tank absorption fields, land shaping and installing the absorption field on the contour help to ensure that the absorption system functions properly. Areas where the slope exceeds 15 percent are not suited to this use. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the soil. Providing coarser grained base material helps to ensure better performance. Cutting and filling are needed to provide a suitable grade in some areas.

The land capability unit is VIe-1, dryland; Silty range site; windbreak suitability group 3.

UcF—Uly-Coly silt loams, 15 to 30 percent slopes. These deep, steep, somewhat excessively drained soils formed in loess on divides and side slopes in the uplands. The Uly soil is on the long, smooth, lower side slopes. The Coly soil is on the upper side slopes and narrow ridgetops. Areas range from 10 to 200 acres in size. They are 45 to 65 percent Uly soil and 30 to 45 percent Coly soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Uly soil has a surface layer of dark grayish brown, friable silt loam about 11 inches thick. The subsoil is friable silt loam about 9 inches thick. The upper part is grayish brown, and the lower part is light brownish gray. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam.

Typically, the Coly soil has a surface layer of grayish brown, very friable silt loam about 5 inches thick. The transition layer is light brownish gray, very friable, calcareous silt loam about 5 inches thick. The underlying material to a depth of more than 60 inches is light gray, calcareous silt loam. In places the surface layer is calcareous.

Included with these soils in mapping are small areas of Hobbs soils on bottom land along narrow drainageways. These included soils are occasionally flooded. They are stratified. Also included are small areas of very steep soils. Included soils make up 10 to 20 percent of the map unit.

Permeability is moderate in the Uly and Coly soils. The available water capacity is high. The organic matter content is moderate in the Uly soil and moderately low in the Coly soil. Runoff is rapid on both soils.

Almost all of the acreage supports native grasses and is used for grazing (fig. 9). Small areas in drainageways are used for hay. These soils are not suited to crops because of the slope and a severe hazard of water erosion. They are suited to range. The climax vegetation is dominantly big bluestem, little bluestem, blue grama, sideoats grama, and western wheatgrass. These species make up 75 percent or more of the total annual forage. Indiangrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, big bluestem and little bluestem decrease in abundance and are replaced by blue grama, needleandthread, sideoats grama, western wheatgrass, sedges, and forbs. If overgrazing continues

Figure 9.—Cattle grazing native grasses in an area of Uly-Coly silt loams, 15 to 30 percent slopes.

for many years, the native plants lose vigor and are unable to stabilize the site. As a result, water erosion is excessive.

If the range is in excellent condition, the suggested initial stocking rate is 0.9 animal unit month per acre on the Uly soil and 0.7 animal unit month per acre on the Coly soil. The proper stocking rate depends on the percentage of each soil in the pasture. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be seeded to a suitable grass mixture if they are used as range. In areas where gullies have formed because of severe water erosion, some land shaping or other mechanical practices may be needed to smooth and stabilize the site before it is seeded.

These soils are not suited to use as sites for septic tank absorption fields because of the slope. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are needed to provide a suitable grade for roads. The roads should be designed so that the surface pavement and base material are thick enough to compensate for the low strength of the Uly soil. Providing coarser grained base material helps to ensure better performance.

The land capability unit is VIe-1, dryland; windbreak suitability group 10. The Uly soil is in the Silty range site, and the Coly soil is in the Limy Upland range site.

UtG—Ustorthents, steep. These deep, somewhat excessively drained and excessively drained soils are on uplands. They consist of soil material that was excavated and stockpiled during the construction of

ditches and irrigation canals. Slopes range from 9 to 30 percent. Areas are long and narrow and range from 10 to 70 acres in size.

The texture, color, and thickness of the layers of these soils vary from one area to another. The surface layer is pale brown, very friable silt loam about 2 inches thick. The underlying material to a depth of more than 60 inches is very light gray, calcareous silt loam.

Included with these soils in mapping are small areas of Coly and Uly soils. These soils are in undisturbed areas. They make up less than 5 percent of the map unit.

Permeability is moderate in the Ustorthents. The available water capacity is moderate. The organic matter content is low. Runoff is rapid or very rapid.

Most areas support sparse to good stands of grasses and weeds. They are used as range or provide habitat for wildlife. These soils are not suited to crops. They are suited to range. This use is effective in controlling water erosion and soil blowing. Overgrazing by livestock depletes the protective plant cover and causes the native plants to deteriorate. Proper grazing use and timely deferment of grazing help to keep the range in good condition.

These soils are suited to wildlife habitat. Most areas provide nesting habitat for pheasants, bobwhite quail, and, in places, waterfowl. Small rodents and other mammals make burrows in some areas and use other areas as escape cover. Predators, such as coyotes, hunt for rodents and game species in areas of these soils. Proper grazing use enhances the habitat for all wildlife species.

These soils are not suited to the trees and shrubs grown as windbreaks or to use as sites for sanitary facilities, dwellings, or roads. Suitable alternative sites are needed.

The land capability unit is VIIs-8, dryland; windbreak suitability group 10. No range site is assigned.

VaE—Valentine fine sand, rolling. This deep, excessively drained soil is on hummocky sandhills in the uplands. It formed in sandy eolian material. Slopes range from 9 to 24 percent. Areas range from 25 to 700 acres in size.

Typically, the surface layer is grayish brown, loose fine sand about 8 inches thick. The transition layer is brown, loose fine sand about 5 inches thick. The underlying material to a depth of more than 60 inches is pale brown fine sand. In places the surface layer is loamy sand or fine sandy loam.

Included with this soil in mapping are small areas of Hersh and Ipage soils. These soils are lower on the landscape than the Valentine soil. Also, Hersh soils have less sand throughout. Ipage soils are moderately well drained. Included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the Valentine soil. The available water capacity is low. The organic matter content also is low. Runoff is slow.

Most areas support native grasses and are used for grazing. A few areas are cut for hay. This soil is not suited to crops because of the slope and a severe hazard of wind erosion. In the areas used as range, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, sand lovegrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is about 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range.

This soil is suited to the trees and shrubs grown as windbreaks. It is so loose that the trees should be planted in shallow furrows with as little surface disturbance as possible. Strips of sod or other vegetation between the tree rows help to control soil blowing. During periods of high winds, windblown sand can damage young seedlings. Weeds and undesirable grasses can be controlled by appropriate herbicides. Supplemental water is needed during dry periods.

This soil is severely limited as a site for septic tank absorption fields because of seepage and slope. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity can result in pollution of the nearby water supplies. A suitable alternative site should be selected. The sides of shallow excavations can cave in unless they are shored. Dwellings should be designed so that they conform to the natural slope of the land, or the site should be graded to a suitable gradient. Cutting and filling are

needed to provide a suitable grade for roads.

The land capability unit is VIe-5, dryland; Sands range site; windbreak suitability group 7.

VbD—Valentine loamy fine sand, 3 to 9 percent slopes. This deep, gently sloping and strongly sloping, excessively drained soil formed in sandy eolian material on uplands. Areas range from 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 7 inches thick. The transition layer is brown, loose loamy fine sand about 5 inches thick. The upper part of the underlying material is pale brown loamy fine sand. The lower part to a depth of more than 60 inches is very pale brown fine sand. In places the surface layer is fine sandy loam.

Included with this soil in mapping are small areas of Hersh and Ipage soils. These soils are lower on the landscape than the Valentine soil. Also, Hersh soils contain less sand throughout. Ipage soils are moderately well drained. Included soils make up 5 to 10 percent of the map unit.

Permeability is rapid in the Valentine soil. The available water capacity is low. The organic matter content also is low. The water intake rate is very high. Runoff is slow.

Most of the acreage supports native grasses and is used as range. A small acreage is used as cropland irrigated by center-pivot sprinklers. This soil is not suited to dryland farming because of a severe hazard of soil blowing and droughtiness.

If irrigated, this soil is poorly suited to corn, grain sorghum, and alfalfa. A sprinkler system is the only suitable method of irrigation. Light and frequent applications of irrigation water are necessary to prevent the leaching of plant nutrients below the root zone. Soil blowing is a severe hazard. Windblown sand can damage young seedlings. Measures that improve fertility and good management of irrigation water are needed. A system of conservation tillage, such as no-till, that keeps crop residue on the surface helps to control soil blowing. Keeping crop residue on the surface and stripcropping also help to control soil blowing.

In the areas used as range, the climax vegetation is dominantly sand bluestem, little bluestem, prairie sandreed, and needleandthread. These species make up 70 percent or more of the total annual forage. Blue grama, switchgrass, sand lovegrass, sedges, and forbs make up the rest. If the range is subject to continuous heavy grazing, sand bluestem, sand lovegrass, little bluestem, and switchgrass decrease in abundance and are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs. If overgrazing continues for many years, the native plants lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is about 0.8 animal unit month per acre. A planned grazing system that includes proper grazing use and timely deferment of grazing helps to maintain or improve the range condition. Properly located fences and watering and salting facilities can result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range.

This soil is suited to the trees and shrubs grown as windbreaks. It is so loose that the trees should be planted in shallow furrows with as little disturbance of the surface as possible. Strips of sod or other vegetation between the tree rows help to control soil blowing. During periods of high winds, windblown sand can damage young seedlings. Weeds and undesirable grasses can be controlled by timely applications of appropriate herbicides. Supplemental water is needed during dry periods.

This soil is suited as a site for dwellings and roads. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the nearby water supplies. The sides of shallow excavations can cave in unless they are shored.

The land capability units are VIe-5, dryland, and IVe-11, irrigated; Sands range site; windbreak suitability group 7.

VeC—Valentine-Bolent complex, 0 to 6 percent slopes. These deep soils formed in sandy eolian and alluvial material. The gently sloping, excessively drained Valentine soil is on hummocks and knolls. The nearly level, somewhat poorly drained Bolent soil is on bottom land between the knolls. It is subject to rare flooding. Areas range from 10 to 125 acres in size. They are 40 to 60 percent Valentine soil and 30 to 50 percent Bolent soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

Typically, the Valentine soil has a surface layer of grayish brown, loose fine sand about 5 inches thick. The underlying material to a depth of more than 60 inches is light brownish gray and light gray fine sand.

Typically, the Bolent soil has a surface layer of dark grayish brown, very friable loamy sand about 6 inches thick. The transition layer is grayish brown, loose loamy sand about 4 inches thick. The underlying material to a depth of more than 60 inches is mottled sand. It is light

brownish gray in the upper part, light gray in the next part, and white in the lower part.

Included with these soils in mapping are small areas of Ipage and Loup soils. Ipage soils are lower on the landscape than the Valentine soil and are moderately well drained. Loup soils are lower on the landscape than the Bolent soil and are poorly drained. Included soils make up 10 to 20 percent of the map unit.

Permeability is rapid in the Valentine and Bolent soils. The available water capacity and the organic matter content are low. The water intake rate is very high. Runoff is slow on the Valentine soil and very slow on the Bolent soil. The seasonal high water table in the Bolent soil is at a depth of about 1.5 feet in wet years and about 3.5 feet in dry years.

Most of the acreage supports native grasses and is used for grazing or is cut for hay. A small acreage is used as irrigated cropland. These soils are not suited to dryland farming because of droughtiness and the hazard of soil blowing.

If irrigated, these soils are poorly suited to corn, grain sorghum, and alfalfa. They are too sandy for gravity irrigation. They are suited to sprinkler irrigation. Light, frequent applications of water are needed to prevent leaching of plant nutrients below the root zone. During dry periods, grasses and crops can benefit from the water table. Tile drainage is generally not needed in the Bolent soil, but the high water table can be a problem during wet periods. Soil blowing is a hazard unless close-growing crops or crop residue adequately protects the surface. Limiting the extent to which crop residue is grazed helps to protect the surface. Adding barnyard manure to the soils increases the organic matter content and improves fertility.

These soils are suited to range. The climax vegetation on the Valentine soil is dominantly sand bluestem, prairie sandreed, little bluestem, and needleandthread. These grasses make up 70 percent or more of the total annual forage on this soil. Sand lovegrass, blue grama, switchgrass, sedges, and forbs make up the rest. The climax vegetation on the Bolent soil is dominantly big bluestem, little bluestem, indiangrass, and switchgrass. These species make up 70 percent or more of the total annual forage on this soil. Prairie cordgrass, sedges, and forbs make up the rest. If subject to continuous heavy grazing or improperly harvested for hay, sand bluestem, little bluestem, sand lovegrass, indiangrass, and switchgrass decrease in abundance. Initially, these species are replaced by needleandthread, blue grama, sand dropseed, sedges, and forbs on the Valentine soil and by western wheatgrass, Kentucky bluegrass, sedges, rushes, and forbs on the Bolent soil. If overgrazing or improper haying methods continue for many years, the native plants on the Valentine soil lose vigor and are unable to stabilize the site. As a result, soil blowing is excessive and blowouts can form.

If the range is in excellent condition, the suggested initial stocking rate is about 0.8 animal unit month per acre on the Valentine soil and 1.7 animal unit months per acre on the Bolent soil. The proper stocking rate depends on the percentage of each soil in the pasture. A uniform distribution of grazing is difficult to attain because the growth rates of plants on the two soils are different. Areas of the Bolent soil become overused before areas of the Valentine soil are fully used. Adjusting the stocking rates helps to prevent overgrazing of the site. A planned grazing system that includes proper grazing use and timely deferment of grazing and haying helps to maintain or improve the range condition. Properly located fences and watering and salting facilities result in a more uniform distribution of grazing. Areas previously used as cropland should be reseeded to a suitable grass mixture if they are used as range.

If these soils are used as hayland, regulating mowing keeps the grasses vigorous. On the Valentine soil, the forage should be harvested only every other year. During the following year, the hayland should be used only as fall or winter range.

These soils are suited to the trees and shrubs grown as windbreaks. They are so loose that the trees should be planted in shallow furrows with as little disturbance of the surface as possible. Strips of sod or other vegetation between the tree rows help to control soil blowing. Preparing the site and planting may not be possible until the water table in the Bolent soil drops and the soil is sufficiently dry. Weeds and undesirable grasses can be controlled by applications of appropriate herbicides.

These soils readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity can result in pollution of the underground water supplies. Constructing the absorption fields on suitable fill material raises them a sufficient distance above the seasonal high water table in the Bolent soil. The sides of shallow excavations in these soils can cave in unless they are shored. In areas of the Bolent soil, they should be shored during a dry period.

The Valentine soil is suited to use as a site for dwellings and local roads. In areas of the Bolent soil, the flooding and the seasonal high water table are limitations. They can be overcome by constructing the

dwellings and roads on raised, well compacted fill material. Establishing adequate side ditches and installing culverts help to prevent the road damage caused by flooding and the seasonal high water table. The damage to roads caused by frost action in the Bolent soil can be minimized by a good surface drainage system and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are VIe-5, dryland, and IVe-11, irrigated. The Valentine soil is in the Sands range site and windbreak suitability group 7. The Bolent soil is in the Subirrigated range site and windbreak suitability group 2S.

Wa—Wann fine sandy loam, 0 to 1 percent slopes. This deep, nearly level, somewhat poorly drained soil formed in stratified alluvium on bottom land. It is subject to rare flooding. Areas range from 10 to 60 acres in size.

Typically, the surface layer is dark grayish brown, very friable, calcareous fine sandy loam about 9 inches thick. The subsurface layer is grayish brown, very friable, calcareous fine sandy loam about 6 inches thick. The transition layer is grayish brown, very friable, calcareous fine sandy loam about 5 inches thick. The upper part of the underlying material is calcareous, light brownish gray fine sandy loam and loamy fine sand. The next part is calcareous, very pale brown fine sand. The lower part to a depth of more than 60 inches is grayish brown sandy clay loam. In some places the surface layer is silt loam. In other places carbonates are below a depth of 20 inches.

Included with this soil in mapping are small areas of Boel, Gibbon, and Libory soils. Boel soils have more sand than the Wann soil. Also, they are lower on the landscape. Gibbon soils are in landscape positions similar to those of the Wann soil. They have more silt and clay than the Wann soil. Libory soils are higher on the landscape than the Wann soil. They formed in sandy eolian material and silty alluvium. Included soils make up about 5 to 10 percent of the map unit.

Permeability is moderately rapid in the Wann soil. The available water capacity is moderate. The organic matter content is moderately low. Runoff is slow. The water intake rate is moderately high. The seasonal high water table ranges from a depth of about 1.5 feet in wet years to about 3.5 feet in dry years. Tilth is good. This soil can be easily tilled throughout a wide range of moisture conditions.

Most of the acreage of this soil is used as irrigated cropland. Some of it is used for dryland crops. A few small areas support native grasses and are used as range.

If used for dryland farming, this soil is suited to corn, grain sorghum, small grain, soybeans, and alfalfa. The wetness caused by the seasonal high water table is the main limitation. It can delay tillage in the spring. Soil blowing is a hazard unless crops or crop residue protects the surface. A system of conservation tillage, such as disc or chisel and plant, or till-plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture. Returning crop residue to the soil increases the organic matter content.

If irrigated, this soil is suited to corn, grain sorghum, soybeans, alfalfa, and introduced grasses. The seasonal high water table can delay tillage in the spring. Gravity and sprinkler irrigation systems are suitable. Some land leveling is needed for gravity irrigation. A system of conservation tillage, such as disc or chisel and plant, or till-plant, that keeps crop residue on the surface helps to control soil blowing and conserves moisture.

This soil is suited to pasture and hay. Smooth bromegrass, tall wheatgrass, switchgrass, big bluestem, and reed canarygrass are suitable. The plants selected for planting should be those that are tolerant of wetness. Continuous overgrazing by livestock or improper haying methods deplete the protective cover and cause the plants to deteriorate. When the soil is wet, overgrazing can cause surface compaction and the formation of small mounds, which make grazing or harvesting for hay difficult. Proper stocking rates and rotation grazing help to keep the pasture in good condition.

This soil is suited to range. Overgrazing by livestock depletes the protective cover and causes the native plants to deteriorate. When the soil is wet, overgrazing can cause surface compaction and the formation of small mounds. Proper grazing use, timely deferment of grazing or haying, and restricted use during wet periods help to keep the native plants in good condition.

This soil is suited to the trees and shrubs grown as windbreaks. The only suitable species are those that can tolerate occasional wetness. Weeds and grasses that compete with the trees for moisture can be controlled by cultivating with conventional equipment between the tree rows and by applying appropriate herbicides in the rows.

If this soil is used as a site for septic tank absorption fields, suitable fill material is needed to raise the absorption fields a sufficient distance above the seasonal high water table. Constructing dwellings on

raised, well compacted fill material helps to prevent the damage caused by flooding and the seasonal high water table. The damage to roads caused by frost action can be minimized by a good surface drainage system and by a gravel moisture barrier in the subgrade. Crowning the road by grading and constructing adequate side ditches help to provide the needed surface drainage.

The land capability units are IIw-6, dryland, and IIw-8, irrigated; Subirrigated range site; windbreak suitability group 2S.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 82,140 acres in the survey area, or about 22 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county, but most are in associations 2, 3, 7, and 8, which are described under the heading "General Soil Map Units."

The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive, and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify for prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

William E. Reinch, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Most of the acreage in Sherman County is farmland. About 38 percent of the farmland is used for cultivated crops, pasture, or hay. Nearly half of the cultivated cropland is irrigated. Corn and alfalfa are the main crops.

Dryland Farm Management

Good management of areas used for dryland crops helps to control runoff and erosion, conserves moisture, and improves tilth.

Terraces, contour farming, and a conservation tillage system that keeps crop residue on the surface help to control water erosion. Keeping crop residue on the surface or establishing a protective plant cover helps to prevent crusting during and after heavy rains. In winter, the stubble holds snow on the field and thus increases the moisture supply.

Soil blowing is not a serious problem in Sherman County if crop residue is left on the surface throughout the winter or until spring planting. A conservation tillage

system that leaves crop residue on the surface helps to control soil blowing. The hazard of erosion will be reduced overall if areas of the more productive soils are used for row crops and the steeper, more erodible soils are used for close-growing crops, such as small grain, or for hay and pasture.

Insufficient rainfall limits crop production in the county. Controlling water erosion and soil blowing allows maximum crop production. On all cropland a suitable cropping system and proper management practices are needed to prevent excessive soil loss, conserve soil moisture, maintain tilth and fertility, and control weeds, insects, and diseases. The management practices and cropping sequence vary with the kind of soil. For example, the management practices required on Coly-Uly silt loams, 6 to 11 percent slopes, eroded, include crop residue management and a conservation tillage system. They also include terraces, contour farming, and grassed waterways. In another example, the management practices required on Cozad silt loam, terrace, 0 to 1 percent slopes, include a conservation tillage system, crop residue management, and additions of manure.

Tillage occasionally is needed to prepare a seedbed and control weeds. Excessive tillage, however, reduces the extent of the plant cover and increases the erodibility of the soil. Thus, only the essential steps in the tillage process should be used.

Various conservation tillage practices can be used in Sherman County. No-till, till-plant, and disc or chisel and plant are well suited to the soils used for row crops. Grasses can be planted by drilling into a cover of stubble without further seedbed preparation.

Applications of fertilizer on soils used for dryland crops should be based on the results of soil tests. Most cultivated areas require nitrogen and phosphorus. Some require trace elements.

Some soils in Sherman County are wet because of a high water table. Open drainage ditches and underground tile drainage systems can help to lower the water table if suitable outlets are available. If the water table cannot be lowered, the crops selected for planting should be those that can tolerate wetness or that grow and mature when the water table is lowest.

Irrigation Management

About 48 percent of the cropland in Sherman County is irrigated. Corn is grown on about 50 percent of the irrigated cropland. A smaller acreage is used for alfalfa hay, grain sorghum, or soybeans. The irrigation water is obtained from wells and canals. Gravity or sprinkler systems are suitable in areas used for corn, grain sorghum, and soybeans. Generally, border or sprinkler systems are used in irrigating alfalfa.

The cropping system used on soils that are well suited to irrigation consists mostly of row crops. A cropping sequence that includes different row crops, such as soybeans, corn, and sorghum, helps to control the diseases and insects common when the same crop is grown year after year.

Gently sloping soils, such as Holdrege silt loam, 3 to 6 percent slopes, are subject to water erosion if they are furrow irrigated down the slope. If furrow irrigated, these soils can be contour bench leveled, or contour furrows can be used in combination with parallel terraces. Land leveling increases the efficiency of furrow irrigation because it results in an even distribution of water. Installing a tailwater recovery system improves the efficiency of a furrow irrigation system.

A tailwater recovery pit can be installed to trap excess irrigation tailwater. The tailwater can then be pumped back onto the field and used again. Tailwater recovery increases the efficiency of the irrigation system and conserves the supply of ground water.

On soils irrigated by a sprinkler system, terraces, contour farming, and a conservation tillage system that keeps crop residue on the surface help to control water erosion. The sprinklers apply the water at a controlled rate. The water is completely absorbed by the soil and does not run off the surface. Sprinklers can be used on the more sloping soils as well as on the nearly level ones. Some soils, such as Valentine loamy fine sand, 3 to 9 percent slopes, are suited to sprinkler irrigation only if erosion is controlled. Because the water can be carefully controlled, sprinklers can be used for special purposes, such as establishing a new pasture on moderately steep soils. The most common types of sprinkler irrigation in Sherman County are the center-pivot and towline systems.

Irrigation is most efficient if started when about half the available water in the soil has been used by crops. Thus, if a soil holds 8 inches of available water, irrigation should be started when about 4 inches has been used by the crops.

All the soils in Nebraska are assigned to irrigation design groups. These groups are described in the Irrigation Guide for Nebraska, which is part of the technical specifications for conservation in Nebraska.

Assistance in planning and designing an irrigation system can be obtained from the local office of the Soil Conservation Service or from the Cooperative

Extension Service. Estimates of the cost of irrigation equipment can be obtained from local dealers and manufacturers.

Weed Control

Suitable cropping sequences or herbicides can control weeds. Rotating different crops in a planned sequence not only helps to control weeds but also increases productivity and the organic matter content. The kinds and amounts of herbicides applied to the soil should be carefully controlled. The colloidal clay and humus fraction of the soil are responsible for most of the chemical activity in the soil. Applications of an excessive amount of herbicide result in crop damage on sandy soils, which are low in content of colloidal clay, and on soils that are moderately low or low in organic matter content. The Cooperative Extension Service can provide additional information about weed control.

Pasture and Hayland Management

Pasture or hayland should be managed for maximum production. When the pasture is established, the grasses should be kept productive. In Sherman County, pastures of introduced grasses consist mainly of cool-season grasses. These grasses start to grow early in spring and reach their peak growth in May or June. Unless the pasture is irrigated, these grasses are dormant during July and August and start to grow again in the fall. For this reason, the grasses grown in the pastured areas should include warm-season grasses or temporary pastures and sudangrass. These grasses both attain their peak growth during July and August. Separate pastures of cool-season grasses and warm-season grasses provide green forage during the entire growing season.

Rotation grazing allows for regrowth of the grasses and legumes used for pasture. A planned grazing system is one in which pastures of cool-season grasses are grazed in rotation. It extends the grazing season and increases forage production. The most commonly grown introduced grasses in cool-season pastures are smooth bromegrass and intermediate wheatgrass. Other cool-season grasses and legumes are adapted to the soils and climate in Sherman County. These are orchardgrass, creeping foxtail, meadow bromegrass, reed canarygrass, alfalfa, birdsfoot trefoil, and cicer milkvetch. When planted as a single species on nonirrigated land, some native warm-season grasses can be grown as a supplement to the cool-season grasses. The warm-season grasses provide high-quality forage during the summer.

Introduced cool-season pasture grasses can be grazed in spring and fall, after they reach a height of 5 or 6 inches. Until they reach this height, they grow on the food reserves stored in their roots and rhizomes. Grazing too early in spring or too late in fall reduces the vigor of the plants.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information

about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for windbreaks, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-8.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units," in the yields table, and in the section "Interpretive Groups," which follows the tables at the back of this survey.

Rangeland

Kenneth L. Hladek, range conservationist, Soil Conservation Service, helped prepare this section.

Rangeland makes up about 58 percent of the total agricultural land in Sherman County. The largest acreage of rangeland is in the Uly-Coly-Holdrege association. The next largest acreage is in the Valentine-Hersh association. Both associations are dominantly rangeland.

The rangeland in the county is used mainly for grazing by livestock. A small acreage is used for native hay production. Some of the cropland in the county produces supplemental feed for livestock.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to

use as rangeland are listed. An explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from natural plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was ascertained during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal high water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition is determined by comparing the present plant community with the potential natural plant community on a particular range site. The more closely the existing community resembles the potential community, the better the range condition. Range condition is an ecological rating only.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Ranching is an important agricultural enterprise in the county. Good range management increases yields of desirable forage plants and thus increases livestock production. The paragraphs that follow can help ranchers and conservationists in planning and managing range. They define a range site, explain how range condition is evaluated, and describe planned grazing systems and other practices in range and hayland management.

Range condition is the present state of vegetation on a range site compared to the potential, or climax, vegetation for that site. Climax vegetation is a stable plant community that represents the most productive combination of forage plants on a given site. It reproduces itself naturally and changes little as long as the climate and condition of the soil remain unchanged. Determining the range condition provides an approximate measure of the deterioration that has taken place in the plant community. More importantly, the range condition provides a basis for predicting the degree of improvement possible under different kinds of management. Four range condition classes, *excellent, good, fair,* and *poor*, are recognized.

Plants manufacture all food for growth in their leaves. Removing plant leaves during the growing season limits the growth of both roots and shoots. Livestock graze selectively, removing more leaves from some plants than from others. This selective grazing varies with the season of use and the degree of range use. Plants respond to grazing in different ways. Some decrease in abundance, some increase, and others not originally part of the plant community can invade. Plant responses to grazing are used in ascertaining the range condition.

Decreaser species are those in the original plant community that decrease in abundance if grazed closely during the growing season. Increaser species are those in the original plant community that normally increase in abundance, at least for a time, as the decreaser plants become less abundant. Invader species are those not in the original plant community that begin to grow in an area after the decreasers and increasers have been

removed or have been less extensive for a period of time.

After the range condition is determined, further investigation can indicate whether the condition is improving or deteriorating. This trend affects adjustments in grazing use and management. Important factors affecting this trend are plant vigor and the reproductive capacity of both desirable and undesirable plant species.

The goal of range management is an excellent range condition. If the range is in excellent condition, the highest yields are obtained on a sustained basis. Also, soil blowing and water erosion are reduced to a minimum without artificial aids, and maximum use is made of rainfall and snowmelt. The paragraphs that follow describe the management needed on the range in Sherman County. This management includes proper grazing use, a planned grazing system, deferred grazing, range seeding, control of blowouts and brush, and proper haying methods.

Proper Grazing Use

Proper grazing use is grazing at an intensity that maintains enough plant cover to protect the soil and that maintains or improves the quantity and quality of desirable vegetation. It is the first and most important step in successful range management. It increases forage production and the vigor and reproductive capacity of desirable plants, which leave enough accumulated litter and mulch to control erosion. The proper intensity of grazing on range used during the entire growing season removes half of the current year's growth.

Proper grazing use is determined by the degree to which desirable species are grazed in key areas. It is affected by stocking rates, the distribution of livestock, and the kinds and classes of livestock.

The stocking rate is the number of grazing animals in a particular pasture. It is based on *animal units* and *animal unit months*. An *animal unit* is a measurement of livestock numbers based on the equivalent of one mature cow and a 6-month-old calf. An *animal unit month* (AUM) is the forage or feed necessary to sustain an animal unit for 1 month. The range site for each map unit and the range condition are used to determine the animal unit months. The proper stocking rates for some soils are given under the heading "Detailed Soil Map Units." The rates are lower for range sites in less than excellent condition.

In an area of Uly silt loam, 6 to 11 percent slopes, the suggested initial stocking rate is about 0.9 animal unit month per acre if the range is in excellent condition. Thus, a 640-acre pasture in excellent condition can carry about 576 animal units for 1 month. If the pasture is to be grazed for 5 months, the suggested initial stocking rate is based on the existing plant community and the average annual forage production of each site. Because of weather conditions, forage production can vary. The suggested rate is intended as an initial stocking rate and can be adjusted to changes in forage production or in the management system.

The proper distribution of livestock throughout a pasture requires planning. Livestock tend to graze most heavily in areas near water, salting facilities, and roads and trails and in the more gently sloping areas. Distant corners of pastures and steep areas may be undergrazed. Undergrazed areas can also result from too few watering facilities or from poorly distributed watering and salting facilities, shade, and supplemental feed. A concentration of livestock results in some severely overused areas and some underused ones. Carefully locating fences and salting and watering facilities helps to achieve a uniform distribution of grazing.

Fences help to distribute grazing in a more uniform pattern. Also, they can divide pastures into sections used in a planned grazing system and can isolate blowouts and reseeded areas. Cross fences that follow natural land features and range sites as much as possible enable all pastures to have similar potential stocking rates. Generally, the smaller pastures are managed more efficiently than the larger ones. This efficiency is a consideration in determining the pasture size.

Properly locating salting facilities is one of the easiest methods of achieving a more uniform distribution of grazing in a pasture. The salting facilities should be located away from the watering facilities. Salt can be easily moved to areas that are undergrazed and can be relocated at different times throughout the grazing season. On the Sands range site, relocating the salting station each time that salt is provided lessens the hazard of soil blowing.

Properly locating watering facilities also can improve the distribution of grazing. In Sherman County most livestock water is drawn from wells. Windmills pump the water from most of the wells. Some dugouts are on the wetter range sites, and some stockwater dams are in the Uly-Coly-Holdrege and Holdrege-Uly-Coly associations. The distance between watering facilities varies with the terrain. In rough or hilly areas, it should

not be more than 0.5 mile. In the more nearly level areas, it should be no more than 1 mile. If overgrazed areas are near watering facilities, the distance between watering facilities is too far.

Range management is affected by the kinds and classes of livestock grazing the pasture. Cattle, sheep, and horses have different grazing habits and nutritional requirements. Grazing habits differ among classes of cattle. Yearlings graze the steeper areas and use a pasture more uniformly than cows with calves. They trail along fence lines, however, and can create blowout problems. Cow-calf pairs may be more of a problem in livestock distribution. They are not so active as yearlings. They graze more on the gentler slopes and tend to stay close to watering facilities.

Planned Grazing Systems

Planned grazing systems are effective in achieving maximum production and in controlling erosion and blowouts. Two or more pastures are alternately rested and grazed in a planned sequence over a period of years. The same pasture is not grazed during the same period 2 years in a row. Planned grazing systems improve plant vigor, the plant community, and the range condition. In addition, they distribute grazing more uniformly and help to maintain maximum productivity over a period of years. The rest period may be any time throughout the year or during all or part of the growing season.

Planned grazing systems should be designed to meet the needs of ranchers. The location of fences and watering facilities, range sites and condition classes, kinds or classes of livestock, and economic factors are used in determining the system best suited to a particular ranch. Planned grazing systems help to overcome the adverse effects of droughts and other climatic conditions on plants. They can eventually increase the stocking rate in pastures. They also help to control parasites and disease among cattle because they generally result in cleaner pastures.

Deferred Grazing

The need for deferment of grazing is based on the range condition and range trend. A beneficial deferment lasts a period of at least 3 consecutive months and coincides with the food storage period of desirable plants. This period varies, depending on the grass species. It is usually August to October for warm-season grasses. Some sites require a deferment of 3 months, but other sites require a deferment of two complete growing seasons. Deferred pastures can be grazed after the first significant frost in fall or early in spring.

Deferred grazing allows plants a prolonged period of rest. If grazing is deferred throughout the growing season, the plant community can improve rapidly. The undisturbed grasses leave a mulch at the surface, thus increasing the rate of water infiltration and reducing the susceptibility to erosion. Deferred grazing allows the desirable grasses to mature, flower, and seed naturally.

Range Seeding

In some areas improved range management alone cannot restore a satisfactory cover of native vegetation. Examples of these areas are formerly cultivated fields and abandoned farmsteads where the original native vegetation has been removed. Range seeding is sometimes needed in these areas.

Good stands of native grasses can be reestablished if the seedbed is properly prepared, well suited species of native grasses are selected for planting, the correct seeding methods are used, and careful managment is applied after seeding. Range seeding is most successful when the seedbed is covered with mulch. This cover helps to keep the soil moist, lowers the surface soil temperature, and helps to control erosion. A temporary crop, such as sudangrass or grain sorghum, can provide this cover. The grass can be seeded directly into the stubble the following fall, winter, or spring. Tillage should be avoided because a firm seedbed is needed. On the sandier soils, proper management practices help to control soil blowing. These include preparing the seedbed and planting the seeds in narrow strips over a period of several years and using a range interseeder.

The seeding mixture should be of suitable native grass species that are normally on the site. Consequently, the mixtures vary with the range sites. Use of a grassland drill with depth bands ensures good placement of seeds at a uniform depth. On soils in the Sands range site and on other soils where seedbed preparation would result in a severe hazard of soil blowing, use of a range interseeder helps to prevent excessive soil blowing.

Newly seeded areas should not be grazed until after the grass is established. Establishment may take from 2 to 3 years, depending on the grass species, the range site, and the method of planting (fig. 10). Initial grazing should be light. Grazing late in fall and in winter is desirable until the stand of grass has reached the desired density.

Additional information about appropriate grass

Figure 10.—Reseeded native grasses in an area of Coly-Uly silt loams, 6 to 11 percent slopes, eroded.

mixtures, grassland drills, and planting times can be obtained from the local office of the Soil Conservation Service or the Lower Loup Natural Resources District.

Control of Blowouts

Blowouts form in areas of sandy soils where tillage or heavy grazing has removed the vegetation. Most blowouts in the sandhills are along livestock trails or in overgrazed areas. Many blowouts have formed on sites for wells, where livestock tend to concentrate. Smaller blowouts generally form along trails or fence lines. Drought increases the extent of blowouts.

Unless blowouts are stabilized, they are likely to enlarge as the wind blows the bare sand to bordering areas. This windblown sand smothers the vegetation in these areas. A planned grazing system can stabilize many areas in 4 to 5 years. Establishing a stable grade on the steep banks around the edges of the blowouts allows them to be revegetated. Locating wells and salting facilities away from blowouts helps to keep livestock from concentrating on or near the blowouts.

In areas where a natural seed source is not available and on large blowouts, reseeding may be necessary. In these areas fences are needed to keep out livestock.

The edges of these areas should be shaped to a suitable grade. If a fast-growing summer crop is planted in spring a suitable mixture of native grass can be drilled into the stubble left from the crop. The cover crop helps to protect the surface from soil blowing and creates a good seedbed. If a cover crop is not practical, a mulch of native hay can be spread over the surface and worked into the sand. After the blowout is seeded, the mulch helps to prevent the damage caused by windblown sand while the grasses are becoming established.

After the grasses are established, proper grazing use and a planned grazing system help to prevent the reactivation of stabilized blowouts.

Brush Control

Small soapweed, yucca, western snowberry, buckbrush, eastern redcedar, and sumac are the main brush species in Sherman County. Although these plants do not constitute a major range problem, they encroach on the range and shade out desirable grasses. Consequently, they reduce grass yields and the carrying capacity of the range.

Western snowberry, eastern redcedar, sumac, and American plum grow mainly in areas of loess. Small soapweed can be a problem on the Thin Loess range site. It can be controlled by selective grazing. If grazed during winter, it loses vigor and may be broken off below the root crown. Using cottonseed cake as a protein supplement increases the amount of small soapweed that cattle consume. Approved herbicides are effective in controlling small soapweed only in spots.

Western snowberry and sumac are best controlled by the use of herbicides. Repeated applications of herbicides may be needed during succeeding years. Further information about the use of herbicides can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Eastern redcedar is best controlled by cutting. The trees should be cut at ground level, below any green tissue. They can be cut by hand or by earthmovers where slopes and topography are suitable. Usually, followup cutting is necessary after earthmovers are used. Approved herbicides or handcutting can help to remove the remaining trees. Deferment of grazing after the use of earthmovers or chemical treatment helps to restore plant vigor and forage quality.

Managing Native Hayland

Some areas of range in Sherman County are used for native hay. In most of these areas, the soils have a seasonal high water table and are in the Wetland, Wet Subirrigated, or Subirrigated range sites in the valley of the Middle Loup River.

Proper management is needed to maintain or improve hay production on wet meadows. Timely mowing is needed to maintain strong plant vigor and a healthy stand. If mowing is avoided during the period between the boot stage and seed maturity, the plant roots can store more carbohydrates. The boot stage is just prior to the emergence of seed heads. Large meadows can be divided into three sections to be mowed in rotation. The best time for mowing is about 2 weeks before the plants reach the boot stage in one section, at the boot stage in the next section, and early in the flowering period in the last section. The order in which sections are mowed should be changed in successive years. A mowing height of 3 inches or more helps to maintain plant vigor.

Meadows should not be grazed or harvested for hay when the soil is wet or the water table is within a depth of 6 inches. Grazing or using heavy machinery at these times can cause the formation of small bogs, ruts, or mounds, which can hinder mowing in later years. After the ground is frozen, livestock can graze without damaging the meadows. Removing the livestock before the ground thaws and the soil becomes wet in the spring protects the meadows.

If the drier sites are used for hay, the forage should be harvested only every other year. During following years, grazing only in fall or winter allows the warm-season grasses to gain vigor and decreases the abundance of cool-season grasses and weeds. The best time for mowing is just before the dominant grasses reach the boot stage. Regulating mowing allows the desirable grasses to remain vigorous and healthy. Early mowing allows the plants enough time to recover. The recovered plants help to hold snow on the surface and thus increase the moisture supply. Technical assistance in managing range and hayland can be obtained from the local office of the Soil Conservation System or the Lower Loup Natural Resources District.

Native Woodland

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Woodland occurs along the major streams and rivers in Sherman County. The wooded areas are confined mostly to narrow bands or strips. Along Mud Creek, however, some large stands of bur oak occur. The woodland covers a small, scattered acreage and has

limited commercial value, but it is an important resource for local use.

The gallery forest along the Middle Loup River in the Loup-Bolent-Barney association has the greatest concentration of woodland in the county. Black willow, peachleaf willow, sandbar willow, indigobush, and eastern cottonwood are the predominant species. Other species include green ash, American elm, eastern redcedar, redosier dogwood, smooth sumac, and gray dogwood.

Streams in areas of the Hord-Hobbs association generally are not heavily wooded, but they support a wide variety of trees. Green ash, American elm, and boxelder are dominant. Other common species are eastern cottonwood, hackberry, willows, mulberry, American plum, common chokecherry, and smooth brome sumac. Nearly pure stands of bur oak occur along Mud Creek, especially on the steep breaks along streams. These stands have an abundant understory of chokecherry, gooseberry, American elm, green ash, and western snowberry. Upland drainageways have some of the same species of trees, but the trees are widely scattered.

In addition to the woodland along the streams and rivers, a few blocks of trees planted as a result of the Timber Claim Act remain. A few Christmas tree plantations are in the county.

Windbreaks and Environmental Plantings

Keith A. Ticknor, forester, Soil Conservation Service, helped prepare this section.

Windbreaks and environmental plantings have been established at various times on most farmsteads and ranch headquarters in Sherman County (fig. 11). In addition, numerous livestock protection windbreaks, field windbreaks, living snow fences, and center-pivot corner plantings are in the county. Siberian elm and eastern redcedar are the predominant species. In the Ipage-Valentine-Libory association, eastern cottonwood was extensively planted. Other common species are ponderosa pine, Scotch pine, jack pine, Austrian pine, Russian-olive, green ash, hackberry, mulberry, boxelder, honeylocust, black walnut, American elm, and lilac.

New tree and shrub plantings are continually needed because old trees pass maturity and deteriorate. Insects, diseases, or storms destroy others. Also, new windbreaks are needed in areas where farming or ranching operations are expanding. Windbreak renovation practices, such as removal and replacement or supplemental planting, are needed to maintain farmstead windbreaks. They are especially needed where old Siberian elm trees are the predominant species.

Field windbreaks and shelterbelts are common in the county. Some field windbreaks are single row plantings, but most shelterbelts consist of 8 to 10 rows of trees and shrubs. Many trees and shrubs were planted under the Prairie States Tree Planting Program in the 1930's and 1940's. The greatest concentration of shelterbelts is in areas of the Loup-Bolent-Barney association.

Windbreaks that protect livestock are extensive in the county. These shelterbelts consist mostly of multiple row plantings of eastern redcedar.

Windbreaks planted parallel to county roads provide living snow fences that keep drifting snow off the roads. The extent of this use has increased rapidly in the last few years. Eastern redcedar is the main species used in these plantings.

To fulfill their intended purpose, the trees and shrubs grown as windbreaks and environmental plantings should be those that are suited to the soil on the site. Selecting suitable species is the first step in ensuring survival and the maximum growth rate. Permeability, available water capacity, fertility, soil texture, and soil depth greatly affect the growth of trees and shrubs.

Establishing trees and shrubs is somewhat difficult in Sherman County because of dry conditions and plant competition. Preparing the site properly before the trees and shrubs are planted and controlling competition from weeds and grasses after planting are important management concerns. Supplemental watering is needed during dry periods. A cover crop is needed on the sandy soils to protect newly planted trees from hot winds and windblown sand.

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and

Figure 11.—A farmstead windbreak in an area of Holdrege silt loam, 1 to 3 percent slopes.

shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens.

At the end of each description under the heading "Detailed Soil Map Units," the soil has been assigned to a windbreak suitability group. These groups are based primarily on the suitability of the soil for the locally adapted species, as is indicated by their growth and vigor. Detailed interpretations for each windbreak suitability group in the county are provided in the Technical Guide, which is available in the local office of the Soil Conservation Service.

Additional information on planning windbreaks and screens and planting and caring for trees and shrubs

can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Hunting and fishing are the popular recreation activities in the county. Pheasant, quail, prairie grouse, cottontail, squirrel, white-tailed deer, mule deer, and mourning dove are the main game species.

Fishing is allowed in the Sherman Reservoir. Walleye, yellow perch, northern pike, catfish, crappie, bluegill, largemouth bass, and carp and other rough fish are the main species. Walleye fishing is best during the spring spawning season along the face of the dam. Mud Creek, Oak Creek, Beaver Creek, Clear Creek, and the Middle Loup River also provide opportunities for fishing. Catfish, bullhead, and carp and other rough fish are the main species. With owner permission, fishing is also available in farm ponds. Largemouth bass, bluegill, and catfish are the main species.

The Nebraska Game and Parks Commission manages three public recreation areas in Sherman County. They are the Sherman Reservoir State Recreation Area, Bowman Lake State Recreation Area, and Beaver Creek State Wildlife Management Area.

The Sherman Reservoir State Recreation Area makes up 1,541 acres of land and 2,845 acres of water. It provides picnic tables, grills, shelters, and approximately 60 campsites. Also, it offers opportunities for boating, fishing, hunting, swimming, and hiking. Heavy irrigation drawdown can lower the water level in the lake during the summer. A 3,180-acre wildlife management area is adjacent to the lake. It provides opportunities for nature study, plant and wildlife photography, and hunting.

The Bowman Lake State Recreation Area, near Loup City, makes up 23 acres of land and 20 acres of water. It provides picnic tables, grills, and approximately 30 campsites. It also provides opportunities for boating and fishing and has many hiking trails.

The Beaver Creek State Wildlife Management Area makes up 17 acres of land and 6 acres of water. It has picnic tables, grills, and some campsites. Water recreation is limited to fishing and boating without motors.

The landscape in Sherman County consists mostly of rolling hills and valleys. Driving the backroads provides many opportunities for photographing or observing birds and other wildlife.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have gentle slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive

foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Wildlife Habitat

Robert O. Koerner, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, smooth brome, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are little bluestem, goldenrod, western wheatgrass, and blue grama.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are green ash, honeylocust, hackberry, and eastern cottonwood. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are sumac, common chokecherry, and American plum.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are ponderosa pine, Eastern redcedar, and Rocky Mountain juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are sandcherry, Amur honeysuckle, western snowberry, and sumac.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are cattails, prairie cordgrass, rushes, sedges, and northern reedgrass.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines (fig. 12). These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, skunk, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, thrushes, woodpeckers, squirrels, red fox, raccoon, deer, and opossum.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, shore birds, muskrat, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include coyote, deer, prairie chicken, meadowlark, and lark bunting.

The soil associations in Sherman County provide a variety of wildlife habitat. The Uly-Coly-Holdrege and Holdrege-Uly-Coly associations consist of soils on long, rolling hills and in valleys. They are used mainly as cropland. The main crops are corn, small grain, and alfalfa. Some areas are irrigated. Standing plant residue is scarce after harvest, and winter food and cover for wildlife are limited. Abandoned farmsteads, road ditches, shelterbelts, drainageways, and fence rows provide most of the winter cover. These associations provide habitat for pheasant, turkey, prairie grouse, cottontail, and some quail.

Areas of the Hord-Hobbs and Loup-Bolent-Barney associations have major streams, drainageways, and bottom land. These associations provide habitat for wetland wildlife, such as muskrat, beaver, and weasel, and for raccoon, squirrel, and cottontail (fig. 13). They also provide cover for shore birds, waterfowl, and hawks, owls, eagles, and other raptors.

The Ipage-Valentine-Libory, Valentine-Hersh, and Cozad-Hord associations, in the valley of the Middle Loup River, provide the greatest diversity of cover types. They support the largest number and kinds of wildlife species. All of the upland, wetland, and woodland species in these associations inhabit the heavy grass and woody cover. Deer, rabbits, and squirrel migrate to the cropland on uplands for food and to the wetlands along the Middle Loup River for water. They return to the escape cover in these associations when threatened.

Mourning doves are throughout the county. The potential for wildlife habitat in Sherman County is good, and providing additional winter cover can improve this potential.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Figure 12.—Grass, shrubs, and trees in an area of Uly-Coly silt loams, 15 to 30 percent slopes, provide habitat for openland wildlife.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the

Figure 13.—A beaver dam in a stream channel in an area of Barney loam, channeled, 0 to 2 percent slopes. This area provides good habitat for wetland wildlife.

potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils

rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and

topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Figure 14.—Terraces in an area of Holdrege and Uly soils.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high

content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff (fig. 14). Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 19.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

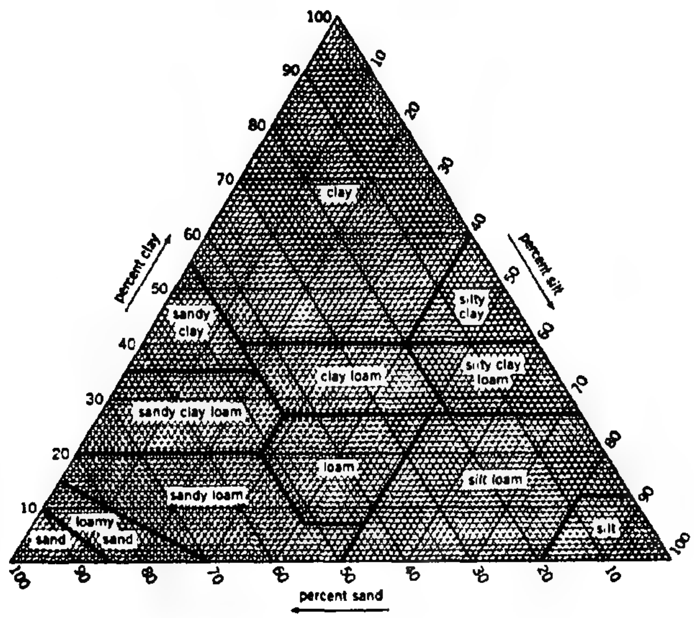

Figure 15.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 15). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(2)* and the system adopted by the American Association of State Highway and Transportation Officials *(1)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic

matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 19.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of

organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if

ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface stoniness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams and by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second

numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Test Data

Table 19 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Nebraska Department of Roads.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Specific gravity—T 100. The group index number that is part of the AASHTO classification is computed by using the Nebraska modified system.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(7)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 20 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haplaquolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is sandy, mixed, mesic Typic Haplaquolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual (6)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (7)*. Unless otherwise stated, matrix colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Anselmo Series

The Anselmo series consists of deep, well drained, moderately rapidly permeable soils on uplands and stream terraces. These soils formed in mixed loamy and sandy eolian material. Slopes range from 0 to 2 percent.

Anselmo soils are adjacent to Boelus, Cozad, and Ipage soils on the stream terraces and Coly, Hersh, Holdrege, and Valentine soils in the uplands. Boelus soils are sandy in the upper part and silty in the lower part. Cozad soils have a silty control section. Boelus and Cozad soils are in landscape positions similar to those of the Anselmo soils or are slightly higher on the landscape. Ipage soils have a sandy control section. They are moderately well drained and are on bottom land. Coly and Holdrege soils have a silty control section. They formed in loess on uplands. Hersh soils are in landscape positions similar to those of Coly and Holdrege soils. They do not have a mollic epipedon. Valentine soils have a sandy control section. They are on dunes.

Typical pedon of Anselmo fine sandy loam, 0 to 2 percent slopes, 950 feet east and 1,650 feet south of the northwest corner of sec. 28, T. 13 N., R. 13 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; neutral; abrupt smooth boundary.

A—8 to 15 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure parting to weak medium granular; soft, very friable; neutral; clear smooth boundary.

Bw1—15 to 18 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to weak fine subangular blocky; soft, very friable; neutral; clear smooth boundary.

Bw2—18 to 29 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; soft, very friable; neutral; gradual smooth boundary.

C1—29 to 45 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 4/3) moist; weak coarse prismatic structure; neutral; gradual smooth boundary.

C2—45 to 60 inches; pale brown (10YR 6/3) loamy very fine sand, brown (10YR 5/3) moist; massive; soft, very friable; neutral.

The solum ranges from 14 to 32 inches in thickness. The mollic epipedon ranges from 7 to 20 inches in thickness. Carbonates are below a depth of 30 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. The Bw horizon has chroma of 2 or 3. It is fine sandy loam or loam. The C horizon has chroma of 2 or 3. It is fine sandy loam, loamy very fine sand, loamy fine sand, or fine sand. In some pedons loamy and silty strata are common below a depth of 40 inches.

Barney Series

The Barney series consists of deep, very poorly drained, rapidly permeable soils on bottom land. These soils formed in stratified, loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Barney soils are adjacent to Bolent and Loup soils, which are on the higher parts of the landscape. Bolent soils are somewhat poorly drained. Loup soils have a mollic epipedon.

Typical pedon of Barney loam, channeled, 0 to 2 percent slopes, 2,100 feet south and 1,600 feet east of the northwest corner of sec. 13, T. 15 N., R. 15 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) loam, very dark gray (10YR 3/1) moist; few fine faint dark yellowish brown (10YR 4/4 moist) mottles; weak medium and fine granular structure; slightly hard, very friable; strong effervescence; mildly alkaline; clear wavy boundary.

C1—8 to 16 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; common medium prominent strong brown (7.5YR 5/6 moist) mottles; single grain; loose; many thin and medium strata of loamy fine sand; mildly alkaline; clear smooth boundary.

C2—16 to 20 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; common medium prominent strong brown (7.5YR 5/6 moist) mottles; single grain; loose; thin strata of very fine sand; neutral; abrupt smooth boundary.

C3—20 to 26 inches; light gray (10YR 7/2) sand, light brownish gray (10YR 6/2) moist; common medium prominent strong brown (7.5YR 5/6 moist) mottles; single grain; loose; thin strata of very fine sand; few fine pebbles; neutral; clear smooth boundary.

C4—26 to 60 inches; light gray (10YR 7/1) sand, gray (10YR 6/1) moist; single grain; loose; thin strata of

loamy fine sand and fine sandy loam; few fine pebbles; neutral.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly loam, but the range includes silt loam, fine sandy loam, and sandy loam. The C horizon has hue of 2.5Y or 10YR and value of 6 or 7 (4 to 6 moist). In many pedons, it has few to many dark grayish brown to strong brown mottles. It is coarse sand, sand, or fine sand stratified with fine sandy loam to gravelly sand.

Boel Series

The Boel series consists of deep, somewhat poorly drained, rapidly permeable soils on bottom land. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Boel soils are adjacent to Bolent, Loup, and Wann soils. Bolent soils are in landscape positions similar to those of the Boel soils. They do not have a mollic epipedon. Loup soils are poorly drained and very poorly drained and are on the lower parts of the landscape. Wann soils are on the higher parts of the landscape. They have a loamy control section.

Typical pedon of Boel fine sandy loam, 0 to 2 percent slopes, 1,300 feet west and 100 feet south of the northwest corner of sec. 13, T. 15 N., R. 15 W.

Ap—0 to 6 inches; gray (10YR 5/1) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine granular structure; soft, very friable; strong effervescence; moderately alkaline; abrupt smooth boundary.

A—6 to 12 inches; dark gray (10YR 4/1) fine sandy loam, very dark gray (10YR 3/1) moist; moderate fine granular structure; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

AC—12 to 15 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak medium granular structure; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

C1—15 to 24 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; common medium distinct yellowish brown (10YR 5/6 moist) mottles; single grain; loose; stratified with thin lenses of very fine sandy loam; mildly alkaline; gradual smooth boundary.

C2—24 to 60 inches; white (10YR 8/2) fine sand, light gray (10YR 7/2) moist; common medium distinct yellowish brown (10YR 5/6 moist) mottles; single grain; loose; mildly alkaline.

The mollic epipedon ranges from 7 to 20 inches in thickness. Some pedons are calcareous throughout.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y and value of 6 to 8 (5 to 7 moist). It has few or common yellowish brown and strong brown mottles. It is dominantly sand, fine sand, or loamy fine sand. In the lower part, however, it commonly has strata of very fine sandy loam to very fine sand.

Boelus Series

The Boelus series consists of deep, well drained soils on stream terraces. These soils formed in sandy eolian material deposited over loess or loamy alluvium (fig. 16). Permeability is rapid in the upper part of the profile and moderate in the lower part. Slopes range from 0 to 3 percent.

The Boelus soils in Sherman County are in a drier climate than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Boelus soils are adjacent to Cozad, Gibbon, Ipage, Libory, and Valentine soils. Cozad soils are higher on the landscape than the Boelus soils. They are silty throughout. Gibbon soils are lower on the landscape than the Boelus soils. They are silty throughout and are somewhat poorly drained. Ipage and Valentine soils have a sandy control section. Ipage soils are in landscape positions similar to those of the Boelus soils. Valentine soils are on dunes. Libory soils are moderately well drained and are lower on the landscape than the Boelus soils.

Typical pedon of Boelus loamy fine sand, 0 to 3 percent slopes, 2,300 feet north and 2,500 feet east of the southwest corner of sec. 14, T. 15 N., R. 15 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

A—8 to 12 inches; brown (10YR 5/3) loamy fine sand, dark brown (10YR 3/3) moist; weak medium granular structure; soft, very friable; slightly acid; clear smooth boundary.

Bw1—12 to 26 inches; brown (10YR 5/3) loamy fine sand, brown (10YR 4/3) moist; weak coarse subangular blocky structure; soft, very friable; slightly acid; abrupt smooth boundary.

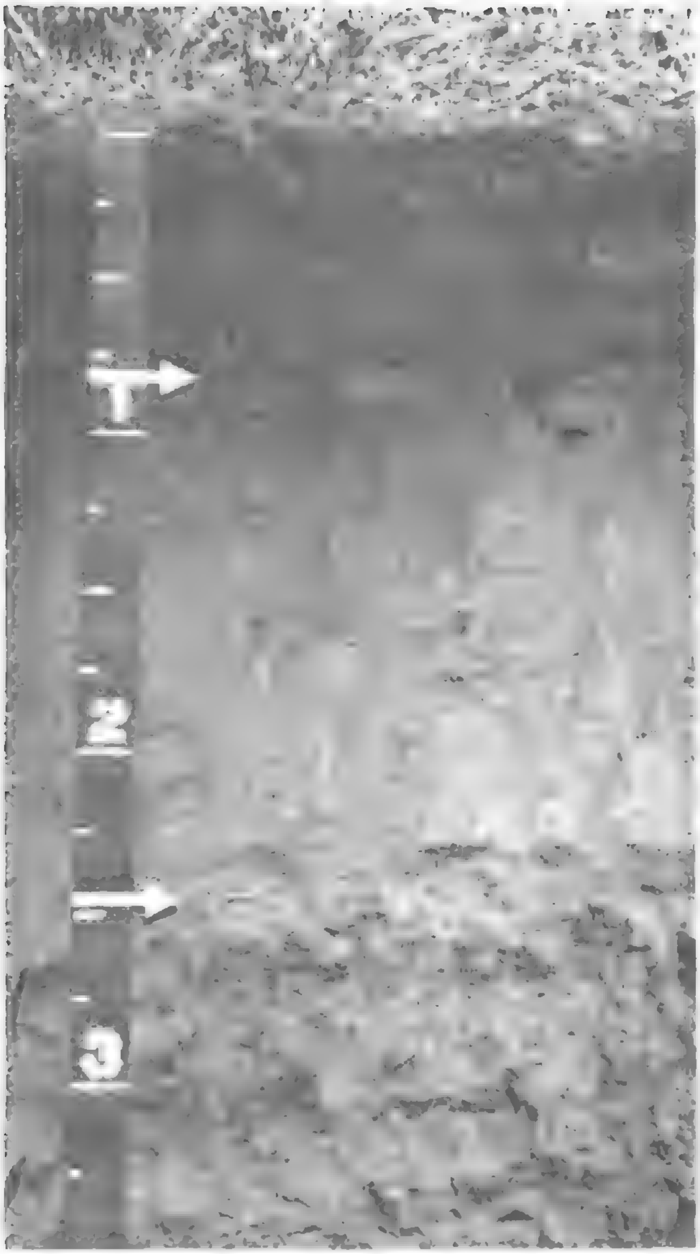

Figure 16.—A profile of Boelus loamy fine sand, 0 to 3 percent slopes. The sandy eolian material is about 29 inches deep over loess. Depth is marked in feet.

2Bw2—26 to 39 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

2C1—39 to 48 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable; neutral; clear smooth boundary.

2C2—48 to 60 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; slight effervescence; mildly alkaline.

The mollic epipedon ranges from 10 to 20 inches in thickness. The solum ranges from 32 to 39 inches in thickness. The depth to silty material ranges from 26 to 40 inches. The depth to carbonates ranges from 36 to 60 inches.

The A horizon has value of 4 or 5 (3 or 4 moist). The Bw horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is sand, loamy sand, or loamy fine sand. The 2Bw horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is loam, silt loam, or silty clay loam. The 2C horizon has chroma of 2 or 3. It is loam, silt loam, or silty clay loam.

Bolent Series

The Bolent series consists of deep, somewhat poorly drained, rapidly permeable soils on bottom land. These soils formed in sandy recent alluvium. Slopes range from 0 to 2 percent.

Bolent soils are adjacent to the poorly drained or very poorly drained Barney and Loup soils on the lower parts of the landscape.

Typical pedon of Bolent loamy sand, 0 to 2 percent slopes, 400 feet west and 2,050 feet south of the northeast corner of sec. 13, T. 15 N., R. 15 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loamy sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; mildly alkaline; abrupt smooth boundary.

AC—7 to 12 inches; light brownish gray (10YR 6/2) fine sand, dark grayish brown (10YR 4/2) moist; common medium faint dark gray (10YR 4/1 moist) mottles; single grain; loose; few fine pebbles; slight effervescence; moderately alkaline; clear smooth boundary.

C1—12 to 36 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; stratified with 1- to 3-inch layers of sandy loam; few fine faint yellowish brown (10YR 5/6 moist) mottles; single grain; loose; few fine pebbles; moderately alkaline; clear smooth boundary.

C2—36 to 60 inches; light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; common medium distinct dark grayish brown (2.5Y 4/2 moist)

mottles; single grain; loose; few fine pebbles; moderately alkaline.

The A horizon has value of 4 or 5 (3 or 4 moist). It is loamy fine sand or loamy sand. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 or 2. It is loamy fine sand, loamy sand, or fine sand. The C horizon has value of 5 to 8 (4 to 7 moist) and chroma of 2 or 3. It has few or common grayish brown to strong brown mottles. It is fine sand or sand stratified with finer or coarser textured material.

Coly Series

The Coly series consists of deep, well drained to excessively drained, moderately permeable soils on uplands. These soils formed in loess. Slopes range from 6 to 60 percent.

Coly soils are adjacent to Hobbs, Holdrege, and Uly soils. Hobbs soils are stratified and are on bottom land. Holdrege and Uly soils have a mollic epipedon. Holdrege soils are on tablelands or divides. Uly soils are on ridges and side slopes.

Typical pedon of Coly silt loam, in an area of Uly-Coly silt loams, 15 to 30 percent slopes, 150 feet north and 30 feet west of the southeast corner of sec. 19, T. 16 N., R. 14 W.

A—0 to 5 inches; grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; mildly alkaline; abrupt smooth boundary.

AC—5 to 10 inches; light brownish gray (10YR 6/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate medium granular structure; slightly hard, very friable; slight effervescence; mildly alkaline; gradual smooth boundary.

C1—10 to 22 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable; common fine threads and accumulations of calcium carbonate; violent effervescence; moderately alkaline.

C2—22 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The depth to carbonates ranges from 0 to 10 inches. The A horizon has value of 5 to 7 (3 or 4 moist) and chroma of 2 or 3. It is 3 to 6 inches thick. The C horizon has value of 6 or 7 (4 to 6 moist) and chroma of 2 or 3. It is silt loam or very fine sandy loam.

Cozad Series

The Cozad series consists of deep, well drained, moderately permeable soils on stream terraces. These soils formed in silty alluvium. Slopes range from 0 to 3 percent.

Cozad soils are adjacent to Gibbon, Hobbs, and Hord soils. Gibbon soils are somewhat poorly drained. They are on bottom land. Hobbs soils are stratified. They are on the lower parts of the landscape. Hord soils are dark to a depth of more than 20 inches. They are in landscape positions similar to those of the Cozad soils.

Typical pedon of Cozad silt loam, terrace, 0 to 1 percent slopes, 130 feet west and 1,900 feet south of the northeast corner of sec. 13, T. 16 N., R. 16 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; slightly acid; abrupt smooth boundary.

A—7 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, very friable; slightly acid; clear smooth boundary.

Bw—14 to 24 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; weak medium and fine subangular blocky structure; slightly hard, very friable; neutral; clear smooth boundary.

C1—24 to 36 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; thin strata of very fine sandy loam and fine sandy loam; neutral; clear smooth boundary.

C2—36 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; massive; soft, very friable; slight effervescence; neutral.

The solum ranges from 14 to 32 inches in thickness. The depth to carbonates ranges from 10 to 48 inches. The mollic epipedon ranges from 10 to 20 inches in thickness.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam and very fine sandy loam. The Bw horizon has value of 5 or 6 (3 or 4 moist). It is silt loam or very fine sandy loam. The C horizon has value of 5 to 7 (4 or 5 moist) and chroma of 2 or 3. It is dominantly silt loam, but the range includes very fine sandy loam. Buried soils are in some pedons.

Gibbon Series

The Gibbon series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in calcareous, silty alluvium. Slopes are 0 to 1 percent.

Gibbon soils are adjacent to Boel and Saltine soils. Boel soils are on the lower parts of the landscape. They have a sandy control section. Saltine soils have more sodium than the Gibbon soils. They are in positions on the landscape similar to those of the Gibbon soils.

Typical pedon of Gibbon silt loam, 0 to 1 percent slopes, 150 feet west and 1,950 feet north of the southeast corner of sec. 24, T. 15 N., R. 15 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; moderately alkaline; abrupt smooth boundary.

A—9 to 14 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—14 to 29 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; common fine distinct dark yellowish brown (10YR 4/4 moist) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable; strong effervescence; moderately alkaline; clear smooth boundary.

C2—29 to 36 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; common fine distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; slightly hard, friable; strong effervescence; moderately alkaline; gradual smooth boundary.

C3—36 to 49 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; common fine distinct dark yellowish brown (10YR 4/4 moist) mottles; massive; slightly hard, friable; strong effervescence; moderately alkaline; gradual smooth boundary.

C4—49 to 60 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct dark brown (7.5YR 4/4 moist) mottles; massive; slightly hard, friable; strong effervescence; moderately alkaline.

The mollic epipedon ranges from 10 to 20 inches in thickness. The depth to carbonates is less than 10 inches. The mollic epipedon ranges from 10 to 20 inches in thickness.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam and very fine sandy loam. The C horizon has value of 5 to 8 (4 to 6 moist) and chroma of 1 or 2. In many pedons it has few or common yellowish brown to dark brown mottles. It is dominantly silt loam, but the range includes silty clay loam and clay loam and some pedons have strata of very fine sandy loam and fine sandy loam.

Hall Series

The Hall series consists of deep, well drained, moderately permeable soils on uplands and stream terraces. These soils formed in loess and silty alluvium. Slopes are 0 to 1 percent.

Hall soils are adjacent to Hobbs, Holdrege, Hord, and Uly soils. Hobbs soils are stratified. They are lower on the landscape than the Hall soils. Holdrege and Uly soils are dark to a depth of less than 20 inches. They are higher on the landscape than the Hall soils. Hord soils are in landscape positions similar to those of the Hall soils. They do not have an argillic horizon.

Typical pedon of Hall silt loam, 0 to 1 percent slopes, 600 feet north and 100 feet west of the southeast corner of sec. 5, T. 15 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A—7 to 16 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

AB—16 to 23 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, firm; neutral; clear smooth boundary.

Bt1—23 to 36 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and fine subangular blocky structure; hard, firm; neutral; clear smooth boundary.

Bt2—36 to 42 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

C1—42 to 50 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive;

slightly hard, friable; slight effervescence; mildly alkaline; clear smooth boundary.

C2—50 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; soft, very friable; strong effervescence; moderately alkaline.

The solum ranges from 30 to 60 inches in thickness. The depth to carbonates ranges from 36 to 60 inches. The mollic epipedon ranges from 20 to 38 inches in thickness. It commonly includes the upper part of the Bt horizon.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is typically silt loam, but the range includes silty clay. The Bt horizon has value of 4 to 6 and chroma of 1 or 2. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

Hersh Series

The Hersh series consists of deep, well drained, moderately rapidly permeable soils on uplands and stream terraces. These soils formed in sandy and loamy eolian material. Slopes range from 3 to 24 percent.

Hersh soils are adjacent to Anselmo, Cozad, Hord, and Valentine soils. Anselmo soils have a mollic epipedon. They are in landscape positions similar to those of the Hersh soils. Cozad and Hord soils have a silty control section. They are lower on the landscape than the Hersh soils. Valentine soils have a sandy control section. They are higher on the landscape than the Hersh soils.

Typical pedon of Hersh fine sandy loam, 3 to 6 percent slopes, 1,250 feet west and 2,300 feet south of the northeast corner of sec. 33, T. 13 N., R. 13 W.

Ap—0 to 8 inches; light brownish gray (10YR 6/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—8 to 14 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak fine granular structure; soft, very friable; neutral; clear smooth boundary.

C—14 to 60 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 4/3) moist; massive; soft, very friable; neutral.

Carbonates are below a depth of 40 inches. The A horizon has value of 4 to 6 (3 or 4 moist) and chroma of 2 or 3. It is dominantly fine sandy loam, but the range includes very fine sandy loam and loamy fine sand. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is fine sandy loam or loamy very fine sand. The C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It is fine sandy loam to loamy fine sand. Some pedons are stratified with finer or coarser textured material below a depth of 40 inches.

Hobbs Series

The Hobbs series consists of deep, well drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. Slopes range from 0 to 3 percent.

Hobbs soils are adjacent to Coly, Cozad, Holdrege, Hord, and Uly soils. Coly, Holdrege, and Uly soils formed in loess on uplands. Cozad and Hord soils are not stratified and have a Bw horizon. They are on stream terraces.

Typical pedon of Hobbs silt loam, 0 to 2 percent slopes, 350 feet east and 150 feet south of the northwest corner of sec. 9, T. 16 N., R. 16 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; slightly hard, very friable; neutral; abrupt smooth boundary.

C1—7 to 26 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; thin and medium bedding planes; neutral; gradual smooth boundary.

C2—26 to 60 inches; stratified dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) silt loam, very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable; medium and thick bedding planes; mildly alkaline.

These soils generally do not have carbonates in the upper 40 inches. In some pedons, however, thin layers of recently deposited material contain free carbonates.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The C horizon generally has value of 4 to 7 (3 to 6 moist) and chroma of 1 or 2. It has thin strata that have higher or lower value. A buried A horizon is common.

Holdrege Series

The Holdrege series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in silty, calcareous loess (fig. 17). Slopes range from 0 to 6 percent.

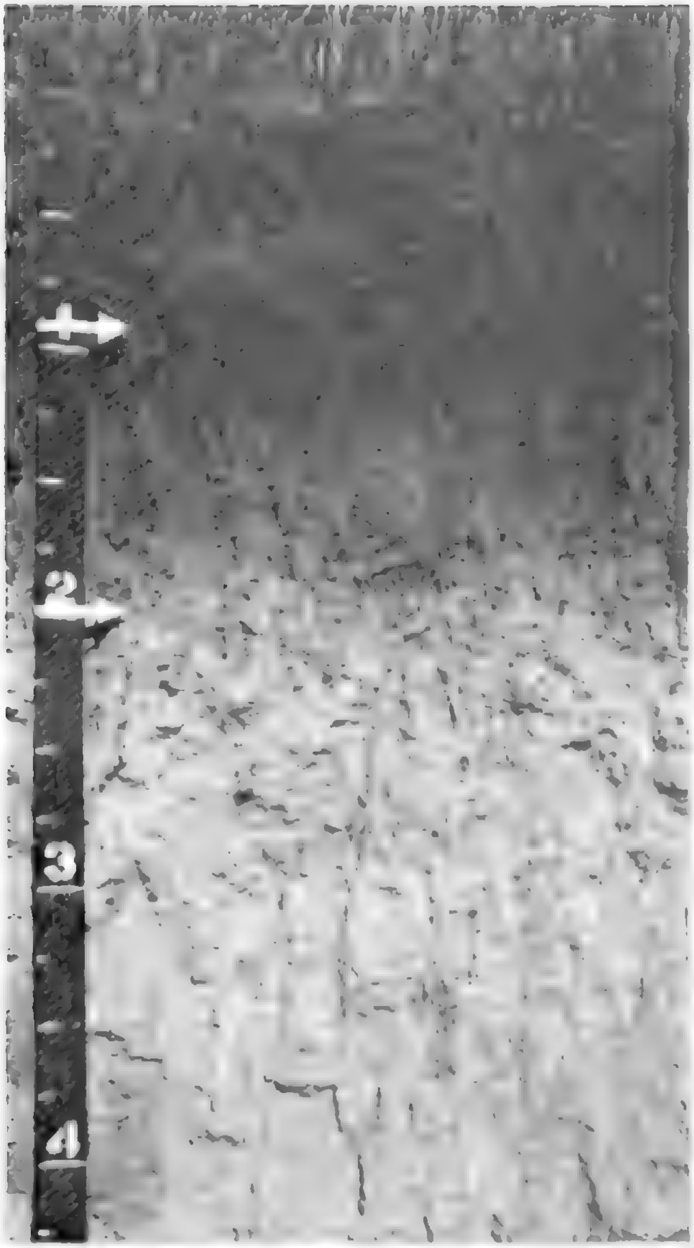

Figure 17.—A profile of Holdrege silt loam. The markers indicate the lower boundary of the subsoil. Depth is marked in feet.

Holdrege soils are adjacent to Coly, Hall, Hobbs, Scott, and Uly soils. Coly and Uly soils do not have an argillic horizon. Coly soils have carbonates close to the surface. They are on the steeper uplands. Hall soils are dark to a depth of more than 20 inches. They are slightly lower on the landscape than the Holdrege soils. Hobbs soils are stratified and are on bottom land. Scott soils are poorly drained and are in upland depressions.

Typical pedon of Holdrege silt loam, 1 to 3 percent slopes, 200 feet west and 2,100 feet south of the northeast corner of sec. 14, T. 13 N., R. 14 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

A—7 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

Bt1—12 to 17 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

Bt2—17 to 24 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; hard, firm; neutral; clear smooth boundary.

BC—24 to 32 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak coarse subangular blocky structure; slightly hard, friable; neutral; gradual smooth boundary.

C—32 to 60 inches; very pale brown (10YR 7/3) silt loam, pale brown (10YR 6/3) moist; massive; slightly hard, very friable; slight effervescence; few soft carbonate accumulations and coatings on some cleavage planes; mildly alkaline.

The solum ranges from 20 to 38 inches in thickness. The depth to free carbonates ranges from 22 to 38 inches. The mollic epipedon ranges from 8 to 20 inches in thickness. It commonly includes the upper part of the Bt horizon.

The A horizon has value of 4 or 5 (2 or 3 moist). It is dominantly silt loam, but the range includes silty clay loam. The Bt horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. It is silty clay loam in which the content of clay is 28 to 35 percent. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 or 3.

Holdrege silty clay loam, 3 to 6 percent slopes, eroded, does not have a mollic epipedon, which is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soil.

Hord Series

The Hord series consists of deep, well drained, moderately permeable soils on stream terraces. These

soils formed in silty alluvium. Slopes range from 0 to 3 percent.

Hord soils are adjacent to Cozad, Hall, and Hobbs soils. Cozad soils are dark to a depth of less than 20 inches. They are slightly higher on the landscape than the Hord soils. Hall soils are lower on the landscape than the Hord soils. Also, they have more clay in the subsoil. Hobbs soils are stratified and are on bottom land.

Typical pedon of Hord silt loam, terrace, 0 to 1 percent slopes, 700 feet east and 150 feet south of the northwest corner of sec. 1, T. 15 N., R. 15 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; neutral; abrupt smooth boundary.

A—8 to 16 inches; dark grayish brown (10YR 4/2) silt loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; slightly hard, friable; slightly acid; clear smooth boundary.

Bw—16 to 27 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

BC—27 to 36 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate coarse subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

C1—36 to 53 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; slight effervescence; mildly alkaline; clear wavy boundary.

C2—53 to 60 inches; pale brown (10YR 6/3) silt loam, brown (10YR 5/3) moist; massive; slightly hard, very friable; few calcium carbonate accumulations; strong effervescence; moderately alkaline.

The solum ranges from 30 to 60 inches in thickness. The mollic epipedon ranges from 27 to 40 inches in thickness. The depth to free carbonates ranges from 30 to 48 inches.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. The Bw horizon has value of 4 or 5 (3 or 4 moist) and chroma of 2 or 3. It is silt loam or silty clay loam. The C horizon has value of 6 or 7 (4 or 5 moist) and chroma of 2 or 3. It is very fine sandy loam, silt loam, or silty clay loam.

Ipage Series

The Ipage series consists of deep, moderately well drained, rapidly permeable soils on stream terraces. These soils formed in sandy eolian and alluvial material. Slopes range from 0 to 3 percent.

Ipage soils are adjacent to Libory, Valentine, and Wann soils. Libory soils have silty material in the lower part. They are in landscape positions similar to those of the Ipage soils. Valentine soils are excessively drained and are on ridges and dunes. Wann soils are somewhat poorly drained and are on bottom land.

Typical pedon of Ipage loamy fine sand, 0 to 3 percent slopes, 450 feet south and 1,700 feet west of the northeast corner of sec. 8, T. 14 N., R. 14 W.

A—0 to 6 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; slightly acid; clear smooth boundary.

AC—6 to 12 inches; grayish brown (10YR 5/2) loamy fine sand, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure; soft, very friable; neutral; clear smooth boundary.

C1—12 to 35 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral; clear smooth boundary.

C2—35 to 40 inches; very pale brown (10YR 7/3) fine sand, brown (10YR 5/3) moist; common medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral; clear smooth boundary.

C3—40 to 45 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral; clear smooth boundary.

C4—45 to 54 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; common medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral; clear smooth boundary.

C5—54 to 60 inches; white (10YR 8/2) fine sand, light brownish gray (10YR 6/2) moist; common medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral.

The A horizon has value of 4 to 6 (3 or 4 moist). It is sand, fine sand, loamy sand, or loamy fine sand. The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. It is sand, fine sand, loamy sand, or

loamy fine sand. The C horizon has value of 6 to 8. It is dominantly fine sand, but sand and coarse sand are common in the lower part. Gray to strong brown mottles are within a depth of 40 inches.

Libory Series

The Libory series consists of deep, moderately well drained soils on stream terraces. These soils formed in sandy eolian material deposited on silty alluvium. Permeability is rapid in the upper part of the profile and moderate in the lower part. Slopes range from 0 to 3 percent.

Libory soils are adjacent to Gibbon, Hersh, Ipage, Valentine, and Wann soils. Gibbon soils are silty throughout. They are somewhat poorly drained and are on the lower parts of the landscape. Hersh soils are well drained and are on the slightly higher parts of the landscape. They are loamy throughout. Ipage soils are sandy throughout. They are in positions on the landscape similar to those of the Libory soils. Valentine soils have a sandy control section. They are higher on the landscape than the Libory soils. Wann soils are somewhat poorly drained and are lower on the landscape than the Libory soils.

Typical pedon of Libory loamy fine sand, 0 to 3 percent slopes, 1,250 feet east and 200 feet south of the northwest corner of sec. 16, T. 14 N., R. 14 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable; medium acid; abrupt smooth boundary.

A—8 to 14 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable medium acid; clear smooth boundary.

Bw1—14 to 22 inches; light brownish gray (10YR 6/2) fine sand, grayish brown (10YR 5/2) moist; few medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral; clear smooth boundary.

Bw2—22 to 32 inches; light gray (10YR 7/2) fine sand, light brownish gray (10YR 6/2) moist; few medium distinct dark yellowish brown (10YR 4/6 moist) mottles; single grain; loose; neutral; abrupt smooth boundary.

2Bw3—32 to 45 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; few fine faint dark yellowish brown (10YR 4/6 moist) mottles; weak medium and coarse subangular blocky structure; hard, firm; neutral; clear smooth boundary.

2C—45 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, friable; slight effervescence; mildly alkaline.

The mollic epipedon ranges from 10 to 20 inches in thickness. Depth to the 2Bw horizon ranges from 20 to 36 inches. Carbonates are at a depth of 40 to 60 inches.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loamy fine sand, loamy sand, or fine sand. The Bw horizon has value of 6 to 8 (5 to 7 moist) and chroma of 2 or 3. It is fine sand, loamy sand, or loamy fine sand. The 2Bw horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. It is very fine sandy loam, loam, silt loam, or silty clay loam. The 2C horizon has value of 5 to 7 (4 to 6 moist) and chroma of 2 or 3. It is very fine sandy loam, silt loam, or silty clay loam.

Loup Series

The Loup series consists of deep, poorly drained and very poorly drained, rapidly permeable soils on bottom land. These soils formed in loamy and sandy alluvium. Slopes range from 0 to 2 percent.

Loup soils are commonly adjacent to Barney, Boel, and Bolent soils. Barney soils are stratified and are on the lower parts of the landscape. Boel and Bolent soils are somewhat poorly drained and are on the higher parts of the landscape.

Typical pedon of Loup loam, wet, 0 to 2 percent slopes, 1,150 feet north and 1,050 feet west of the southeast corner of sec. 1, T. 16 N., R. 16 W.

A1—0 to 5 inches; dark gray (10YR 4/1) fine sandy loam, black (10YR 2/1) moist; weak fine granular structure; soft, very friable; strong effervescence; mildly alkaline; clear smooth boundary.

A2—5 to 10 inches; very dark gray (10YR 3/1) fine sandy loam, black (10YR 2/1) moist; few medium prominent olive brown (2.5Y 4/6 moist) mottles; weak fine granular structure; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—10 to 31 inches; light gray (10YR 7/2) fine sand, grayish brown (10YR 5/2) moist; few medium distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; neutral; clear smooth boundary.

C2—31 to 60 inches; white (10YR 8/1) fine sand, light gray (10YR 7/1) moist; few fine distinct strong brown (7.5YR 5/6 moist) mottles; single grain; loose; mildly alkaline.

The mollic epipedon ranges from 7 to 20 inches in thickness. Reddish yellow to olive brown mottles are commonly throughout the profile.

The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is loamy sand, fine sandy loam, loam, or silt loam. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (4 to 7 moist), and chroma of 1 or 2. It is fine sand, loamy sand, or sand.

Ronson Series

The Ronson series consists of moderately deep, well drained, moderately rapidly permeable soils on stream terraces. These soils formed in loamy material deposited on calcareous sandstone. Slopes range from 0 to 3 percent.

Ronson soils are adjacent to Anselmo, Cozad, and Ipage soils. The adjacent soils do not have bedrock within a depth of 60 inches. Anselmo and Cozad soils are in positions on the landscape similar to those of the Ronson soils. Anselmo soils have a cambic horizon. Cozad soils have a silty control section. Ipage soils are sandy throughout. They are on the higher parts of the landscape.

Typical pedon of Ronson fine sandy loam, 0 to 3 percent slopes, 2,000 feet south and 1,200 feet east of the northwest corner of sec. 5, T. 13 N., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark brown (10YR 2/2) moist; weak fine granular structure; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

AC—8 to 16 inches; light brownish gray (10YR 6/2) sandy loam, grayish brown (10YR 5/2) moist; weak fine granular structure; soft, very friable; violent effervescence; moderately alkaline; clear wavy boundary.

C1—16 to 20 inches; white (10YR 8/2) sandy loam mixed with sandstone fragments; very pale brown (10YR 7/3) moist; massive; soft, very friable; violent effervescence; moderately alkaline; clear smooth boundary.

C2—20 to 27 inches; light gray (10YR 7/2) sandy loam, pale brown (10YR 6/3) moist; massive; soft, very fr able; violent effervescence; moderately alkaline; clear smooth boundary.

Cr—27 to 60 inches; white (10YR 8/2), soft, bedded sandstone, very pale brown (10YR 7/3) moist; violent effervescence; moderately alkaline.

The depth to sandstone bedrock ranges from 20 to 40 inches. Carbonates are within 20 inches of the surface.

The A horizon has value of 4 or 5 (2 or 3 moist) and chroma of 1 or 2. It is fine sandy loam or sandy loam. The AC horizon has value of 5 or 6 (4 or 5 moist). It is sandy loam or fine sandy loam. The C horizon has value of 5 to 8 (4 to 6 moist) and chroma of 2 or 3. It is sandy loam or fine sandy loam. Sandstone fragments are mixed throughout the C horizon. The Cr horizon has chroma of 2 or 3. The calcareous sandstone bedrock is soft or hard.

Saltine Series

The Saltine series consists of deep, somewhat poorly drained, moderately slowly permeable soils on bottom land. These soils formed in silty alluvium. Slopes are 0 to 1 percent.

Saltine soils are adjacent to Boel and Gibbon soils. Boel soils are lower on the landscape than the Saltine soils. They have a sandy control section. Gibbon soils have less sodium than the Saltine soils. They are in landscape positions similar to those of the Saltine soils.

Typical pedon of Saltine silt loam, in an area of Gibbon-Saltine silt loams, 0 to 1 percent slopes, 250 feet north and 850 feet east of the southwest corner of sec. 19, T. 15 N., R. 14 W.

Ap—0 to 7 inches; gray (10YR 5/1) silt loam, dark gray (10YR 4/1) moist; few fine distinct dark yellowish brown (10YR 4/6 moist) mottles; weak fine granular structure; slightly hard, friable; strong effervescence; very strongly alkaline; abrupt smooth boundary.

Bw1—7 to 16 inches; gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct dark yellowish brown (10YR 4/6 moist) mottles; weak fine subangular blocky structure; hard, firm; strong effervescence; strongly alkaline; clear smooth boundary.

Bw2—16 to 22 inches; gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct dark yellowish brown (10YR 4/6 moist) mottles; weak fine subangular blocky structure; hard, firm; strong effervescence; strongly alkaline; clear smooth boundary.

C1—22 to 34 inches; light gray (10YR 7/1) silt loam,

gray (10YR 5/1) moist; few fine distinct dark yellowish brown (10YR 4/6 moist) mottles; massive; slightly hard, friable; slight effervescence; strongly alkaline; clear smooth boundary.

C2—34 to 43 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; many medium distinct dark yellowish brown (10YR 4/6 moist) mottles; massive; slightly hard, friable; moderately alkaline; clear smooth boundary.

C3—43 to 60 inches; light gray (2.5Y 7/2) silt loam, grayish brown (2.5Y 5/2) moist; common medium distinct dark yellowish brown (10YR 4/6 moist) mottles; massive; slightly hard, friable; moderately alkaline.

The solum ranges from 16 to 28 inches in thickness. The depth to carbonates ranges from 0 to 10 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 or 5 (3 or 4 moist), and chroma of 1 or 2. It is dominantly silt loam, but the range includes loam. It is mildly alkaline to very strongly alkaline. The Bw horizon has value of 5 or 6 (4 or 5 moist) and chroma of 1 or 2. It is silt loam or silty clay loam. It is strongly alkaline or very strongly alkaline. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 (4 to 6 moist), and chroma of 1 or 2. It commonly has dark yellowish brown or yellowish brown mottles. It is typically silt loam, but the range includes silty clay loam and loam and some pedons are fine sandy loam or loamy fine sand below a depth of 40 inches. This horizon is mildly alkaline to very strongly alkaline.

Scott Series

The Scott series consists of deep, very poorly drained, very slowly permeable soils in upland depressions. These soils formed in loess. Slopes are 0 to 1 percent.

Scott soils are adjacent to Holdrege and Hall soils. The adjacent soils have less clay in the subsoil than the Scott soils. Also, they are slightly higher on the landscape.

Typical pedon of Scott silty clay loam, 0 to 1 percent slopes, 300 feet south and 300 feet west of the northeast corner of sec. 11, T. 13 N., R. 14 W.

A1—0 to 8 inches; dark gray (10YR 4/1) silty clay loam, black (10YR 2/1) moist; moderate fine subangular blocky structure; slightly hard, friable; neutral; clear smooth boundary.

A2—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; strong medium subangular blocky structure; slightly hard, friable; slightly acid; abrupt smooth boundary.

E—13 to 16 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate thin platy structure; slightly hard, friable; neutral; abrupt smooth boundary.

Bt1—16 to 34 inches; very dark gray (10YR 3/1) silty clay, black (10YR 2/1) moist; strong medium angular blocky structure; hard, very firm; shiny ped surfaces; neutral; clear smooth boundary.

Bt2—34 to 40 inches; dark gray (10YR 4/1) silty clay, black (10YR 2/1) moist; few fine distinct dark yellowish brown (10YR 4/4 moist) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; hard, very firm; neutral; clear smooth boundary.

C1—40 to 43 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; few fine faint yellowish brown (10YR 5/4 moist) mottles; massive; hard, firm; neutral; clear smooth boundary.

C2—43 to 60 inches; very dark gray (10YR 3/1) silty clay loam, black (10YR 2/1) moist; hard, firm; neutral.

The solum ranges from 40 to 52 inches in thickness. The A horizon has value of 3 to 5 (2 or 3 moist) and chroma of 1 or 2. It is dominantly silty clay loam, but the range includes silt loam. The E horizon has hue of 10YR or 2.5Y, value of 5 or 6 (4 or 5 moist), and chroma of 1 or 2. The Bt horizon has value of 3 or 4 (2 or 3 moist) and chroma of 1 or 2. It is silty clay or clay that has a clay content ranging from 40 to 50 percent. The C horizon has value of 4 to 6 (3 to 5 moist) and chroma of 2 or 3. It is clay loam, silty clay loam, or silt loam. Dark buried strata are common in the lower part of this horizon.

Uly Series

The Uly series consists of deep, well drained and somewhat excessively drained, moderately permeable soils on side slopes and ridgetops in the uplands (fig. 18). These soils formed in loess. Slope ranges from 6 to 30 percent.

Uly soils are commonly adjacent to Coly, Hobbs, and Holdrege soils. Coly soils are dark to a depth of less than 7 inches. They are on the steeper side slopes and narrow ridgetops. Hobbs soils are stratified and are on bottom land. Holdrege soils have more clay in the subsoil than the Uly soils. They are on nearly level to gently sloping uplands.

Figure 18.—A profile of Uly silt loam. The arrows indicate the lower boundaries of the surface layer and subsoil. Depth is marked in feet.

Typical pedon of Uly silt loam, in an area of Uly-Coly silt loams, 15 to 30 percent slopes, 1,400 feet north and 2,300 feet east of the southwest corner of sec. 4, T. 15 N., R. 16 W.

A—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; slightly hard, friable; neutral; clear smooth boundary.

Bw—11 to 17 inches; grayish brown (10YR 5/2) silt loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable; mildly alkaline; clear smooth boundary.

BC—17 to 20 inches; light brownish gray (10YR 6/2) silt loam, grayish brown (10YR 5/2) moist; weak medium and coarse subangular blocky structure; slightly hard, friable; moderately alkaline; clear smooth boundary.

C—20 to 60 inches; light gray (10YR 7/2) silt loam, light brownish gray (10YR 6/2) moist; massive; slightly hard, very friable; violent effervescence; threads and accumulations of carbonate; moderately alkaline.

The solum ranges from 16 to 32 inches in thickness. The mollic epipedon ranges from 8 to 20 inches in thickness. In some pedons it extends into the upper part of the B horizon. The depth to carbonates ranges from 9 to 23 inches.

The A horizon has value of 3 or 4 (2 or 3 moist). The Bw horizon has value of 4 or 5 (2 to 4 moist) and chroma of 2 or 3. It is dominantly silt loam, but in some pedons it is silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 6 to 8 (5 or 6 moist), and chroma of 2 or 3. It is silt loam or very fine sandy loam. Carbonates occur as threads, coatings on ped faces, or small accumulations.

The Uly soils in the map units Coly-Uly silt loams, 6 to 11 percent slopes, eroded, and Coly-Uly silt loams, 11 to 17 percent slopes, eroded, do not have a mollic epipedon, which is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Valentine Series

The Valentine series consists of deep, excessively drained, rapidly permeable soils on uplands. These soils formed in sandy eolian material (fig. 19). Slopes range from 3 to 24 percent.

Valentine soils are adjacent to Hersh, Ipage, and Libory soils. Hersh soils have less sand in the control section than the Valentine soils. Also, they are lower on the landscape. Ipage and Libory soils are moderately well drained and are on stream terraces. Libory soils have loamy material in the lower part.

Typical pedon of Valentine fine sand, rolling, 1,350

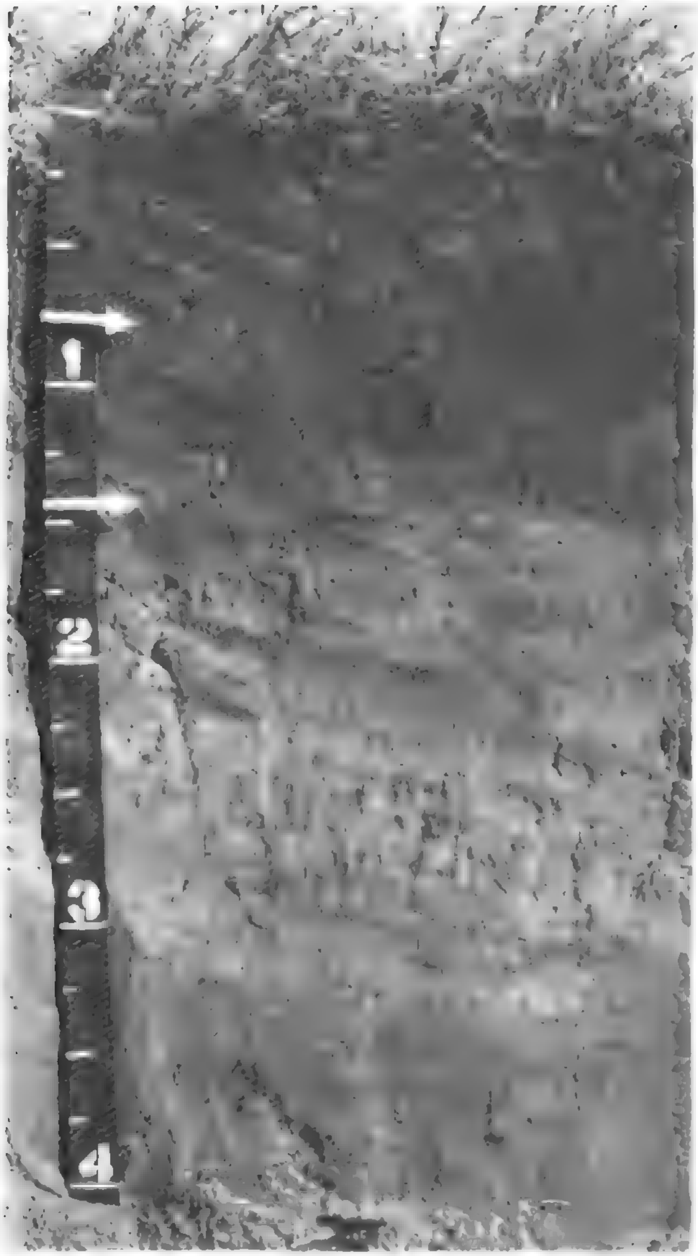

Figure 19.—A profile of Valentine loamy fine sand, 3 to 9 percent slopes. The arrows indicate the lower boundaries of the surface layer and transition layer. Depth is marked in feet.

feet north and 300 feet west of the southeast corner of sec. 14, T. 14 N., R. 14 W.

A—0 to 8 inches; grayish brown (10YR 5/2) fine sand, dark grayish brown (10YR 4/2) moist; single grain; loose; slightly acid; clear smooth boundary.

AC—8 to 13 inches; brown (10YR 5/3) fine sand, dark brown (10YR 4/3) moist; single grain; loose; slightly acid; clear smooth boundary.

C—13 to 60 inches; pale brown (10YR 6/3) fine sand, brown (10YR 5/3) moist; single grain; loose; neutral.

The soils are dominantly fine sand throughout, but the range includes loamy sand and loamy fine sand. The A horizon has value of 4 to 6 (3 to 5 moist). The AC horizon has value of 5 or 6 (4 or 5 moist) and chroma of 2 or 3. The C horizon has value of 6 or 7 (5 or 6 moist) and chroma of 2 to 4.

Wann Series

The Wann series consists of deep, somewhat poorly drained, moderately rapidly permeable soils on bottom land. These soils formed in stratified alluvium. Slopes are 0 to 1 percent.

Wann soils are adjacent to Boel, Gibbon, Libory, and Loup soils. Boel and Loup soils are lower on the landscape than the Wann soils. Boel soils have a sandy control section. Loup soils are poorly drained or very poorly drained. Gibbon soils have a silty control section. They are slightly higher on the landscape than the Wann soils. Libory soils are moderately well drained and are higher on the landscape than the Wann soils.

Typical pedon of Wann fine sandy loam, 0 to 1 percent slopes, 60 feet east and 2,200 feet north of the southwest corner of sec. 9, T. 14 N., R. 14 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak medium and fine granular structure; soft, very friable; slight effervescence; moderately alkaline; abrupt smooth boundary.

A—9 to 15 inches; grayish brown (10YR 5/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; soft, very friable; strong effervescence; moderately alkaline; clear smooth boundary.

AC—15 to 20 inches; grayish brown (10YR 5/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; few fine distinct yellowish brown (10YR 5/6 moist) mottles; weak medium and fine subangular blocky structure; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C1—20 to 27 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; common medium distinct dark yellowish brown

(10YR 4/6 moist) mottles; massive; soft, very friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—27 to 30 inches; light brownish gray (10YR 6/2) loamy fine sand, grayish brown (10YR 5/2) moist; common medium distinct olive brown (2.5Y 4/4 moist) mottles; single grain; loose; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3—30 to 40 inches; light brownish gray (10YR 6/2) fine sandy loam, grayish brown (10YR 5/2) moist; common medium distinct olive brown (2.5Y 4/4 moist) mottles; massive; soft, very friable; slight effervescence; moderately alkaline; clear smooth boundary.

C4—40 to 54 inches; very pale brown (10YR 7/3) fine sand, pale brown (10YR 6/3) moist; single grain; loose; slight effervescence; moderately alkaline; abrupt smooth boundary.

C5—54 to 60 inches; grayish brown (2.5Y 5/2) sandy clay loam, dark grayish brown (2.5Y 4/2) moist; massive; slightly hard, friable; moderately alkaline.

The mollic epipedon ranges from 9 to 20 inches in thickness. The depth to carbonates ranges from 0 to 20 inches.

The A horizon has value of 2 or 3 when moist and chroma of 1 or 2. The C horizon has chroma of 1 to 3. It is dominantly fine sandy loam or sandy loam, but strata of loamy fine sand or loam 1 to 3 inches thick are common in the control section. Stratified sand to sandy clay loam is below a depth of 40 inches.

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated and slowly change it into a natural body that has genetically related horizons. Relief conditions the effects of climate and plant and animal life. The parent material affects the kind of soil that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Usually, a long time is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Climate

Climate has had an important effect on soil formation in Sherman County. It affects soils directly through its effect on the parent material and indirectly through its effect on vegetation and micro-organisms.

The climatic factors that affect soil formation are rainfall, fluctuating temperatures, and wind. Runoff of rainwater removes, relocates, and sorts soil material. The wind removes, sorts, and redeposits soil material. The extensive deposits of loess in the county are examples of the importance of wind as an agent of deposition. Alternate freezing and thawing and wetting and drying speed the chemical and mechanical weathering processes and loosen and mix the soil material, thus improving the physical condition of the soil.

Micro-organisms in the soil are most active at a defined temperature range. Thus, the rate at which organic matter is decomposed into humus varies with the climatic conditions. Changes in temperature and moisture activate the weathering of parent material, which results in chemical and physical changes in the soil.

Because the humidity in Sherman County is generally low, the soil loses a fairly high amount of water through evaporation and transpiration. Thus, the soil has less water available for leaching, plant growth, decomposition of organic matter, and chemical weathering.

Parent Material

Parent material is the weathered or partly weathered material in which a soil forms. It affects the chemical and mineralogical composition of the soil. The soils in Sherman County formed in loess, sandy eolian material, and alluvium.

Loess is wind-deposited silty material. Peoria Loess is the most extensive parent material in Sherman County. It is a thick mantle on tablelands, in valleys, and on dissected uplands. It is generally grayish to brownish material ranging from a few feet to 100 feet in thickness. Coly, Holdrege, Scott, and Uly are the major soils formed in Peoria Loess. Cozad, Hobbs, and Hord soils on stream terraces and bottom land formed in alluvial material derived mainly from Peoria Loess. Underlying the Peoria Loess is the Loveland Loess Formation, which ranges from silty to sandy and is reddish brown. None of the soils in Sherman County formed in Loveland Loess. This loess is generally exposed only at the base of road cuts and in deep canyons.

Sandy eolian material covers a small area in the southeastern part of Sherman County, adjacent to Howard and Buffalo Counties. The hummocky ridge

forming the divide between Rock Creek and the valley of the Middle Loup River and areas of sand dunes on the stream terraces are also covered with eolian material. Most of this material was blown from the valley and transported only a short distance. It is brown and pale brown. It ranges from a few feet to as much as 100 feet in thickness. Valentine soils are the dominant soils formed in this parent material. They are characterized by very little profile development because the sandy material is resistant to weathering. Hersh soils formed in mixed sandy and loamy eolian material in the loess-sand transition areas adjacent to the sandhills.

Alluvium, or water-deposited material, is on bottom land and stream terraces in broad stream valleys or in narrow upland drainageways. It ranges widely in texture because it formed in many different kinds of material and was deposited in several different ways. Cozad and Hord soils formed in alluvium on stream terraces. Barney, Bolent, Hobbs, and Loup soils formed in the more recent alluvium on bottom land.

Plant and Animal Life

Plants, burrowing animals, micro-organisms, earthworms, and other living organisms affect soil formation. The soils in Sherman County formed mainly under a mixture of short, mid, and tall grasses. Every year, the grasses formed new growth above the ground and their fibrous roots penetrated the upper few feet of the soil. In time, a darkened layer developed at the surface. This layer gradually thickened as more organic matter decayed into humus. The additional humus caused the development of granular soil structure and good tilth. Plant roots bring nutrients to the surface. Calcium is particularly helpful in keeping the soils more porous. Organic acids form during the decomposition of organic material. In solution, they hasten the leaching process.

The action of micro-organisms helps to change undecomposed organic matter into humus. Some bacteria take in nitrogen from the air. As they die, they release nitrogen available for plant growth. Other bacteria oxidize sulphur, which then becomes available to plants. The plants in turn complete the cycle by producing more organic matter. Other living organisms, such as algae, fungi, protozoa, and actinomycetes, affect the physical and chemical makeup of the soil. Larger animals, such as gophers and moles, and earthworms, millipedes, spiders, and other insects help in mixing the soil and in adding organic matter after they die.

Relief

Relief affects soil formation mainly through its effect on runoff, erosion, aeration, and drainage. Runoff is more rapid on steep and very steep soils than on less sloping soils. Consequently, plant growth generally is less vigorous on the steeper soils, less water penetrates the surface, soil horizons are thinner and less distinct, lime is not so deeply leached, and, all other factors being equal, erosion is more severe.

Relief can cause differences in the color, thickness, and horizonation of soils that formed in the same kind of parent material. For example, differences among Coly, Uly, Holdrege, and Scott soils, which formed in Peoria Loess, can be attributed mainly to differences in relief. The gradient, shape, length, and direction of the slopes influence the amount of moisture in the soils. The steep and very steep Coly soils are weakly developed, have a thin surface layer, and have lime at or near the surface. In Uly soils, which are less steep than Coly soils, the surface layer is thicker, lime is leached to a greater depth, and a thin subsoil has formed. In the nearly level to gently sloping Holdrege soils, the surface layer is dark and thick, the subsoil is well developed, and lime is leached to a greater depth than is typical in Uly soils. Scott soils formed in depressional areas. They are the most strongly developed soils in Sherman County.

Barney, Bolent, and Hobbs soils are in areas of low relief on bottom land. They commonly receive new sediment during periods of flooding. Each flood provides new parent material and starts a new cycle of soil formation. Hobbs silt loam, channeled, 0 to 3 percent slopes, for example, formed on bottom land and is frequently flooded.

Time

In time, relief, climate, and plant and animal life change the parent material into a soil. If the parent material has been in place for only a short time, the soils are weakly developed. The degree of profile development depends on the intensity of the soil-forming factors. The distinctness of horizons in the soil profile is commonly a reflection of the length of time that the geological material has been in place.

The time needed for a soil to form depends mainly on the kind of parent material and the climate. The resistance of the parent material to weathering partly determines the length of time that is needed. Generally, soils in warm, humid areas form more rapidly than soils in cool, dry areas.

Soil maturity is related not only to time but also to the other four soil-forming factors. Soils that do not have a B horizon are commonly considered immature, and soils that have a well developed B horizon are considered mature. The maturity of a soil, however, depends on the interaction of all five soil-forming factors. Thus, the very steep Coly soils, which do not have a B horizon, may have matured as much as is possible on their particular slopes and under their particular climate.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Animal unit month. The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boot stage. The time in the growth of grasses when the flowering head is in the upper sheaf, just prior to emergence.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Carrying capacity. The maximum stocking rate that can be used without damaging the vegetation or related resources.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to

soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Decreasers. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow.

Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Invaders. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, invader plants follow disturbance of the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Organic matter content. The amount of organic matter in the soil. The classes of organic matter content used in this survey are very low, less than 0.5 percent; low, 0.5 to 1.0 percent; moderately low, 1.0 to 2.0 percent; moderate, 2.0 to 4.0 percent; and high, 4.0 to 8.0 percent.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Planned grazing system. A system in which two or more units of grazing land are alternately rested and grazed in a planned sequence over a period of years.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability,

the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. The removal of not more than 50 percent, by weight, of the key management plants when an area of range or pasture is grazed. Proper grazing use protects the surface by maintaining an adequate plant cover. It also maintains or improves the quality and quantity of desirable vegetation.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor, on the basis of how much the present plant community has departed from the potential.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6 0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7 3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8 4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9 1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then

multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey area the classes of slope are—

Nearly level	0 to 2 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 6 percent
Undulating	3 to 9 percent
Strongly sloping	6 to 11 percent
Rolling	9 to 24 percent
Moderately steep	11 to 17 percent
Steep	17 to 30 percent
Hilly	more than 24 percent
Very steep	30 to 60 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stocking rate. The number of livestock per unit of grazing land.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling

emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-81 at Loup City, Nebraska)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	33.3	8.9	21.1	63	-19	0	0.44	0.11	0.70	2	5.5
February----	39.5	14.8	27.2	73	-15	12	.72	.20	1.13	2	6.5
March-------	47.9	23.1	35.5	81	-5	26	1.57	.45	2.47	4	6.5
April-------	63.3	36.2	49.8	89	16	95	2.41	1.04	3.56	6	1.6
May---------	73.2	47.4	60.3	94	27	332	3.76	1.79	5.45	7	.2
June--------	83.2	57.6	70.4	102	39	612	3.97	2.19	5.54	7	.0
July--------	88.8	62.9	75.9	104	49	803	3.28	1.97	4.44	6	.0
August------	87.0	60.5	73.8	101	44	738	2.61	1.22	3.80	6	.0
September---	78.1	49.6	63.9	99	31	417	2.33	.84	3.56	5	.0
October-----	67.2	36.9	52.1	90	18	149	1.40	.50	2.15	3	.6
November----	50.4	23.8	37.1	77	1	0	.81	.09	1.34	2	3.3
December----	38.5	14.1	26.3	69	-14	0	.66	.21	1.03	2	7.2
Yearly:											
Average---	62.5	36.3	49.5	---	---	---	---	---	---	---	---
Extreme---	---	---	---	104	-21	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,184	23.96	19.40	28.23	52	31.4

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-81 at Loup City, Nebraska)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 26	May 7	May 19
2 years in 10 later than--	Apr. 21	May 2	May 14
5 years in 10 later than--	Apr. 12	Apr. 23	May 6
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 16	Oct. 1	Sept. 21
2 years in 10 earlier than--	Oct. 20	Oct. 5	Sept. 25
5 years in 10 earlier than--	Oct. 27	Oct. 15	Oct. 4

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-81 at Loup City, Nebraska)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	183	151	131
8 years in 10	188	159	138
5 years in 10	198	174	151
2 years in 10	208	189	164
1 year in 10	213	197	171

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
An	Anselmo fine sandy loam, 0 to 2 percent slopes	810	0.2
Ba	Barney loam, channeled, 0 to 2 percent slopes	2,060	0.6
Bp	Boel fine sandy loam, 0 to 2 percent slopes	1,960	0.5
BrB	Boelus loamy fine sand, 0 to 3 percent slopes	670	0.2
Bt	Bolent loamy sand, 0 to 2 percent slopes	3,850	1.1
CrG	Coly-Hobbs silt loams, 2 to 60 percent slopes	6,600	1.8
CuD2	Coly-Uly silt loams, 6 to 11 percent slopes, eroded	62,710	17.1
CuE2	Coly-Uly silt loams, 11 to 17 percent slopes, eroded	62,200	17.0
Cz	Cozad silt loam, terrace, 0 to 1 percent slopes	3,650	1.0
CzB	Cozad silt loam, terrace, 1 to 3 percent slopes	3,550	1.0
Fu	Fluvaquents, sandy	520	0.1
Gn	Gibbon silt loam, 0 to 1 percent slopes	5,130	1.4
Gs	Gibbon-Saltine silt loams, 0 to 1 percent slopes	1,200	0.3
Ha	Hall silt loam, 0 to 1 percent slopes	580	0.2
Hb	Hall silt loam, terrace, 0 to 1 percent slopes	1,710	0.5
HeC	Hersh fine sandy loam, 3 to 6 percent slopes	1,770	0.5
HgF	Hersh-Valentine complex, 9 to 24 percent slopes	1,050	0.3
Hk	Hobbs silt loam, 0 to 2 percent slopes	12,040	3.2
HmB	Hobbs silt loam, channeled, 0 to 3 percent slopes	6,500	1.8
Ho	Holdrege silt loam, 0 to 1 percent slopes	760	0.2
HoB	Holdrege silt loam, 1 to 3 percent slopes	10,990	3.0
HoC	Holdrege silt loam, 3 to 6 percent slopes	5,130	1.4
HpC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded	12,820	3.5
Ht	Hord silt loam, terrace, 0 to 1 percent slopes	9,010	2.5
HtB	Hord silt loam, terrace, 1 to 3 percent slopes	8,750	2.4
IpB	Ipage loamy fine sand, 0 to 3 percent slopes	5,140	1.4
LbB	Libory loamy fine sand, 0 to 3 percent slopes	2,200	0.6
Lo	Loup fine sandy loam, 0 to 2 percent slopes	3,980	1.1
Lp	Loup loam, wet, 0 to 2 percent slopes	2,140	0.6
RsB	Ronson fine sandy loam, 0 to 3 percent slopes	130	*
Sc	Scott silty clay loam, 0 to 1 percent slopes	390	0.1
UbD	Uly silt loam, 6 to 11 percent slopes	17,260	4.7
UbE	Uly silt loam, 11 to 17 percent slopes	9,290	2.5
UcF	Uly-Coly silt loams, 15 to 30 percent slopes	84,650	23.1
UtG	Ustorthents, steep	370	0.1
VaE	Valentine fine sand, rolling	2,600	0.7
VbD	Valentine loamy fine sand, 3 to 9 percent slopes	3,710	1.0
VeC	Valentine-Bolent complex, 0 to 6 percent slopes	290	0.1
Wa	Wann fine sandy loam, 0 to 1 percent slopes	2,470	0.7
	Water areas more than 40 acres in size	5,440	1.5
	Total	366,080	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
An	Anselmo fine sandy loam, 0 to 2 percent slopes
Cz	Cozad silt loam, terrace, 0 to 1 percent slopes
CzB	Cozad silt loam, terrace, 1 to 3 percent slopes
Gn	Gibbon silt loam, 0 to 1 percent slopes (where drained)
Ha	Hall silt loam, 0 to 1 percent slopes
Hb	Hall silt loam, terrace, 0 to 1 percent slopes
HeC	Hersh fine sandy loam, 3 to 6 percent slopes
Hk	Hobbs silt loam, 0 to 2 percent slopes
Ho	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HpC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded
Ht	Hord silt loam, terrace, 0 to 1 percent slopes
HtB	Hord silt loam, terrace, 1 to 3 percent slopes
Wa	Wann fine sandy loam, 0 to 1 percent slopes

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS

(Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability		Corn		Winter wheat		Grain sorghum		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
An----------------- Anselmo	IIe	IIe	40	135	36	---	50	105	30	40	2.5	5.5
Ba----------------- Barney	VI	---	---	---	---	---	---	---	---	---	---	---
Bp----------------- Boel	IIIw	IIIw	45	110	27	---	40	95	---	---	3.4	5.0
BrB---------------- Boelus	IIIe	IIIe	42	130	30	---	50	100	25	45	3.0	5.5
Bt----------------- Bolent	IVw	IVw	28	105	25	---	---	---	---	---	3.2	---
CrG---------------- Coly-Hobbs	VIIe	---	---	---	---	---	---	---	---	---	---	---
CuD2--------------- Coly-Uly	IVe	IVe	28	100	23	---	28	85	---	---	1.6	5.0
CuE2--------------- Coly-Uly	VIe	---	---	---	---	---	---	---	---	---	---	---
Cz----------------- Cozad	IIc	I	50	145	42	---	58	115	35	50	4.0	6.5
CzB---------------- Cozad	IIe	IIe	46	140	39	---	53	110	30	40	3.6	6.3
Fu*---------------- Fluvaquents	VIIIw	---	---	---	---	---	---	---	---	---	---	---
Gn----------------- Gibbon	IIw	IIw	60	130	38	---	70	105	31	36	4.5	6.1
Gs----------------- Gibbon-Saltine	IVs	IVs	35	80	25	---	40	75	---	---	3.0	4.5
Ha----------------- Hall	IIc	I	53	148	42	---	55	115	---	---	3.0	6.5
Hb----------------- Hall	IIc	I	55	150	43	---	60	120	35	50	4.0	6.5
HeC---------------- Hersh	IIIe	IIIe	32	120	27	---	38	90	---	---	1.9	4.4
HgF---------------- Hersh-Valentine	VIe	---	---	---	---	---	---	---	---	---	---	---
Hk----------------- Hobbs	IIw	IIw	66	140	36	---	65	110	33	40	3.6	6.5
HmB---------------- Hobbs	VIw	---	---	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS--Continued

Soil name and map symbol	Land capability		Corn		Winter wheat		Grain sorghum		Soybeans		Alfalfa hay	
	N	I	N	I	N	I	N	I	N	I	N	I
			Bu	Bu	Bu	Bu	Bu	Bu	Bu	Bu	Tons	Tons
Ho---------------- Holdrege	IIc	I	52	145	40	---	55	115	---	---	2.8	6.5
HoB--------------- Holdrege	IIe	IIe	48	140	39	---	53	110	---	---	2.6	6.3
HoC--------------- Holdrege	IIIe	IIIe	44	130	36	---	50	105	---	---	2.5	5.8
HpC2-------------- Holdrege	IIIe	IIIe	38	120	31	---	46	100	---	---	2.2	5.5
Ht---------------- Hord	IIc	I	55	150	43	---	60	120	35	50	4.0	6.5
HtB--------------- Hord	IIe	IIe	53	145	41	---	55	115	---	---	3.6	6.3
IpB--------------- Ipage	IVe	IVe	28	105	20	---	32	90	---	---	1.5	4.5
LbB--------------- Libory	IIIe	IIIe	45	135	30	---	50	100	30	45	3.4	5.5
Lo, Lp------------ Loup	Vw	---	---	---	---	---	---	---	---	---	---	---
RsB--------------- Ronson	IIIe	IIIe	25	120	25	---	30	75	20	35	1.5	4.5
Sc---------------- Scott	IVw	---	---	---	15	---	30	---	---	---	---	---
UbD--------------- Uly	IVe	IVe	32	115	29	---	35	90	---	---	2.0	5.6
UbE--------------- Uly	VIe	---	---	---	---	---	---	---	---	---	---	---
UcF--------------- Uly-Coly	VIe	---	---	---	---	---	---	---	---	---	---	---
UtG*-------------- Ustorthents	VIIs	---	---	---	---	---	---	---	---	---	---	---
VaE--------------- Valentine	VIe	---	---	---	---	---	---	---	---	---	---	---
VbD--------------- Valentine	VIe	IVe	---	90	15	---	---	75	---	---	---	3.0
VeC--------------- Valentine-Bolent	VIe	IVe	---	90	15	---	---	75	---	---	---	3.5
Wa---------------- Wann	IIw	IIw	50	125	34	---	65	95	20	32	3.5	5.8

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(All soils are assigned to nonirrigated capability subclasses (N). Only potentially irrigable soils are assigned to irrigated subclasses (I). Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I (N)	---	---	---	---	---
(I)	15,710	---	---	---	---
II (N)	59,450	24,100	19,640	---	15,710
(I)	43,740	24,100	19,640	---	---
III (N)	24,680	22,720	1,960	---	---
(I)	24,680	22,720	1,960	---	---
IV (N)	90,550	85,110	4,240	1,200	---
(I)	94,160	89,110	3,850	1,200	---
V (N)	6,120	---	6,120	---	---
VI (N)	172,350	163,790	8,560	---	---
VII (N)	6,970	6,600	---	370	---
VIII (N)	520	---	520	---	---

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

(Only the soils that support rangeland vegetation suitable for grazing are listed)

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
An: Anselmo	Sandy	Favorable	3,500	Little bluestem	25
		Normal	3,300	Sand bluestem	15
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	15
				Blue grama	10
				Switchgrass	5
				Western wheatgrass	5
Ba: Barney	Wetland	Favorable	5,500	Prairie cordgrass	20
		Normal	5,200	Northern reedgrass	20
		Unfavorable	5,000	Bluejoint reedgrass	20
				Sedge	10
				Rush	10
				Plains bluegrass	5
Bp: Boel	Subirrigated	Favorable	5,200	Big bluestem	30
		Normal	4,900	Indiangrass	15
		Unfavorable	4,600	Little bluestem	10
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	5
BrB: Boelus	Sandy	Favorable	3,500	Little bluestem	20
		Normal	3,300	Needleandthread	20
		Unfavorable	3,000	Prairie sandreed	20
				Blue grama	10
				Sand bluestem	5
Bt: Bolent	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,200	Little bluestem	15
				Prairie cordgrass	10
				Switchgrass	10
				Sedge	5
CrG*:					
Coly	Thin Loess	Favorable	2,800	Little bluestem	35
		Normal	2,600	Big bluestem	20
		Unfavorable	2,400	Sideoats grama	10
				Plains muhly	5
				Sedge	5
				Indiangrass	5
				Switchgrass	5
Hobbs	Silty Overflow	Favorable	4,500	Big bluestem	30
		Normal	4,000	Western wheatgrass	20
		Unfavorable	3,800	Little bluestem	15
				Switchgrass	10
				Sideoats grama	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
CuD2*, CuE2*:					
Coly	Limy Upland	Favorable	3,300	Little bluestem	30
		Normal	3,000	Big bluestem	20
		Unfavorable	2,700	Sideoats grama	10
				Western wheatgrass	10
				Sedge	5
				Blue grama	5
				Indiangrass	5
Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5
Cz, CzB Cozad	Silty Lowland	Favorable	4,500	Big bluestem	30
		Normal	4,200	Little bluestem	20
		Unfavorable	3,800	Western wheatgrass	15
				Sideoats grama	10
				Blue grama	5
				Sedge	5
Fu*. Fluvaquents					
Gn Gibbon	Subirrigated	Favorable	5,500	Big bluestem	25
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Kentucky bluegrass	5
Gs*:					
Gibbon	Subirrigated	Favorable	5,500	Big bluestem	25
		Normal	5,300	Little bluestem	15
		Unfavorable	5,000	Indiangrass	15
				Switchgrass	10
				Prairie cordgrass	10
				Sedge	10
				Kentucky bluegrass	5
Saltine	Saline Subirrigated	Favorable	3,800	Alkali sacaton	20
		Normal	3,400	Western wheatgrass	15
		Unfavorable	3,000	Switchgrass	10
				Inland saltgrass	10
				Blue grama	10
				Sedge	5
				Slender wheatgrass	5
				Buffalograss	5
Ha Hall	Silty	Favorable	4,000	Little bluestem	25
		Normal	3,600	Big bluestem	20
		Unfavorable	3,300	Western wheatgrass	15
				Blue grama	10
				Sideoats grama	10
				Switchgrass	5
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Composition
			Lb/acre		Pct
Hb: Hall	Silty Lowland	Favorable	4,000	Little bluestem	25
		Normal	3,600	Big bluestem	20
		Unfavorable	3,300	Western wheatgrass	15
				Blue grama	10
				Sideoats grama	10
				Switchgrass	5
				Sedge	5
HeC: Hersh	Sandy	Favorable	3,500	Sand bluestem	30
		Normal	3,300	Little bluestem	25
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
HgF*:					
Hersh	Sandy	Favorable	3,500	Sand bluestem	30
		Normal	3,300	Little bluestem	25
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Blue grama	5
				Switchgrass	5
Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5
Hk, HmB: Hobbs	Silty Overflow	Favorable	4,500	Big bluestem	30
		Normal	4,000	Western wheatgrass	20
		Unfavorable	3,800	Little bluestem	15
				Switchgrass	10
				Sideoats grama	5
				Sedge	5
Ho, HoB, HoC, HpC2: Holdrege	Silty	Favorable	4,000	Big bluestem	20
		Normal	3,600	Little bluestem	20
		Unfavorable	3,300	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Indiangrass	5
				Buffalograss	5
				Sand dropseed	5
				Sedge	5
Ht: Hord	Silty Lowland	Favorable	4,500	Big bluestem	30
		Normal	4,200	Little bluestem	20
		Unfavorable	3,800	Switchgrass	10
				Western wheatgrass	10
				Sideoats grama	5
				Blue grama	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production: Kind of year	Total production: Dry weight	Characteristic vegetation	Compo- sition
			Lb/acre		Pct
HtB: Hord	Silty Lowland	Favorable	4,000	Big bluestem	20
		Normal	3,600	Little bluestem	20
		Unfavorable	3,300	Blue grama	10
				Needleandthread	10
				Western wheatgrass	10
				Sideoats grama	5
				Buffalograss	5
IpB: Ipage	Sandy Lowland	Favorable	3,500	Sand bluestem	25
		Normal	3,200	Little bluestem	20
		Unfavorable	3,000	Prairie sandreed	15
				Needleandthread	10
				Indiangrass	5
				Sedge	5
				Switchgrass	5
				Blue grama	5
LbB: Libory	Sandy Lowland	Favorable	4,300	Sand bluestem	30
		Normal	3,500	Little bluestem	20
		Unfavorable	2,700	Prairie sandreed	20
				Switchgrass	15
				Indiangrass	10
Lo: Loup	Wet Subirrigated	Favorable	5,800	Switchgrass	25
		Normal	5,500	Indiangrass	15
		Unfavorable	5,300	Prairie cordgrass	15
				Big bluestem	15
				Plains bluegrass	5
				Northern reedgrass	5
Lp: Loup	Wetland	Favorable	6,000	Prairie cordgrass	30
		Normal	5,800	Northern reedgrass	20
		Unfavorable	5,500	Bluejoint reedgrass	20
				Sedge	10
				Rush	5
RsB: Ronson	Sandy	Favorable	3,000	Sand bluestem	20
		Normal	2,800	Little bluestem	15
		Unfavorable	1,700	Prairie sandreed	15
				Needleandthread	15
				Blue grama	10
				Switchgrass	5
				Sedge	5
Sc. Scott					
UbD, UbE: Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5
UcF*:					
Uly	Silty	Favorable	3,700	Big bluestem	25
		Normal	3,200	Little bluestem	25
		Unfavorable	2,700	Sideoats grama	10
				Blue grama	10
				Western wheatgrass	10
				Sedge	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
UcF*:					
Coly	Limy Upland	Favorable	3,300	Little bluestem	30
		Normal	3,000	Big bluestem	20
		Unfavorable	2,700	Sideoats grama	10
				Western wheatgrass	10
				Sedge	5
				Blue grama	5
				Indiangrass	5
UtG*. Ustorthents					
VaE, VbD	Sands	Favorable	3,000	Sand bluestem	25
Valentine		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5
VeC*:					
Valentine	Sands	Favorable	3,000	Sand bluestem	25
		Normal	2,600	Little bluestem	20
		Unfavorable	2,200	Prairie sandreed	20
				Switchgrass	10
				Sand lovegrass	5
				Blue grama	5
				Needleandthread	5
Bolent	Subirrigated	Favorable	5,500	Big bluestem	30
		Normal	5,000	Indiangrass	15
		Unfavorable	4,200	Little bluestem	15
				Prairie cordgrass	10
				Switchgrass	10
				Sedge	5
Wa	Subirrigated	Favorable	5,500	Big bluestem	30
Wann		Normal	5,300	Little bluestem	20
		Unfavorable	5,000	Indiangrass	10
				Prairie cordgrass	10
				Switchgrass	5
				Sedge	5
				Slender wheatgrass	5
				Plains bluegrass	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
An: Anselmo	Lilac, American plum.	Common chokecherry	Eastern redcedar, Austrian pine, ponderosa pine, Scotch pine, honeylocust, green ash, hackberry, Russian mulberry.	Siberian elm	---
Ba. Barney					
Bp: Boel	Redosier dogwood, American plum.	Common chokecherry	Hackberry, green ash, Austrian pine, Russian mulberry, eastern redcedar.	Honeylocust, silver maple, golden willow.	Eastern cottonwood.
BrB: Boelus	Lilac, skunkbush sumac.	Siberian peashrub, Manchurian crabapple, eastern redcedar, Russian olive.	Green ash, ponderosa pine, hackberry, honeylocust.	Siberian elm	---
Bt: Bolent	American plum, lilac, Siberian peashrub.	Manchurian crabapple.	Eastern redcedar, ponderosa pine, hackberry, green ash.	Golden willow, honeylocust.	Eastern cottonwood.
CrG*: Coly.					
Hobbs	American plum	Amur honeysuckle, lilac, Siberian peashrub.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
CuD2*, CuE2*: Coly	Silver buffaloberry, fragrant sumac, Siberian peashrub.	Eastern redcedar, Rocky Mountain juniper, bur oak, Russian olive.	Green ash, ponderosa pine, honeylocust, Siberian elm.	---	---
Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Cz, CzB: Cozad	American plum	Lilac, Amur honeysuckle.	Eastern redcedar, Austrian pine, Russian olive, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.
Fu*. Fluvaquents					
Gn: Gibbon	Lilac	Siberian peashrub, common chokecherry.	Eastern redcedar, hackberry, Manchurian crabapple, ponderosa pine.	Honeylocust, green ash, golden willow.	Eastern cottonwood.
Gs*:					
Gibbon	Lilac	Siberian peashrub, common chokecherry.	Eastern redcedar, hackberry, Manchurian crabapple, ponderosa pine.	Honeylocust, green ash, golden willow.	Eastern cottonwood.
Saltine	Silver buffaloberry.	Russian olive	Golden willow, Siberian elm.	---	Eastern cottonwood.
Ha, Hb: Hall	Amur honeysuckle, lilac, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian olive.	Siberian elm	---
HeC: Hersh	Lilac, American plum.	Common chokecherry	Eastern redcedar, honeylocust, hackberry, ponderosa pine, green ash, Russian mulberry, Scotch pine, Austrian pine.	Siberian elm	---
HgF*:					
Hersh.					
Valentine.					
Hk, HmB: Hobbs	American plum	Amur honeysuckle, lilac, Siberian peashrub.	Eastern redcedar, Austrian pine, ponderosa pine, green ash, Russian mulberry.	Hackberry, honeylocust.	Eastern cottonwood.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ho, HoB, HoC, HpC2: Holdrege	Lilac, Amur honeysuckle, fragrant sumac.	Russian mulberry	Eastern redcedar, Austrian pine, green ash, honeylocust, hackberry, bur oak, Russian olive.	Siberian elm	---
Ht: Hord	Peking cotoneaster	Lilac, Siberian peashrub, American plum.	Eastern redcedar, ponderosa pine, blue spruce, Manchurian crabapple.	Golden willow, green ash, hackberry.	Eastern cottonwood.
HtB: Hord	---	Eastern redcedar, Siberian peashrub, American plum, lilac.	Ponderosa pine, hackberry, blue spruce, bur oak, Russian olive.	Green ash, honeylocust.	---
IpB: Ipage	Lilac, skunkbush sumac.	Eastern redcedar, Siberian peashrub, Manchurian crabapple, Russian olive.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
LbB: Libory	Skunkbush sumac, lilac.	Eastern redcedar, Russian olive, Manchurian crabapple, Siberian peashrub.	Ponderosa pine, green ash, honeylocust, hackberry.	Siberian elm	---
Lo: Loup	Redosier dogwood	---	---	Golden willow	Eastern cottonwood.
Lp. Loup					
RsB: Ronson	Lilac, Peking cotoneaster.	Rocky Mountain juniper, eastern redcedar, Siberian peashrub, Manchurian crabapple.	Ponderosa pine, Russian olive, green ash, honeylocust, bur oak.	Siberian elm	---
Sc. Scott					
UbD, UbE: Uly	Amur honeysuckle, lilac.	Common chokecherry, Russian mulberry.	Eastern redcedar, green ash, Russian olive, honeylocust, Austrian pine, hackberry, bur oak.	Siberian elm	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
UcF*:					
Uly.					
Coly.					
UtG*.					
Ustorthents					
VaE, VbD---------- Valentine	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
VeC*:					
Valentine---------	---	Eastern redcedar, Rocky Mountain juniper.	Ponderosa pine, Austrian pine, jack pine.	---	---
Bolent------------	American plum, lilac, Siberian peashrub.	Manchurian crabapple.	Eastern redcedar, ponderosa pine, hackberry, green ash.	Golden willow, honeylocust.	Eastern cottonwood.
Wa---------------- Wann	---	Siberian peashrub, lilac.	Eastern redcedar, ponderosa pine, hackberry, blue spruce.	Green ash, honeylocust, golden willow, silver maple.	Eastern cottonwood.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
An---------- Anselmo	Slight----------	Slight----------	Slight----------	Slight.
Ba---------- Barney	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.
Bp---------- Boel	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
BrB---------- Boelus	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
Bt---------- Bolent	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Moderate: wetness.
CrG*:				
Coly----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.
Hobbs----------	Severe: flooding.	Slight----------	Moderate: slope, flooding.	Slight.
CuD2*, CuE2*:				
Coly----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.
Uly----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
Cz---------- Cozad	Severe: flooding.	Slight----------	Slight----------	Slight.
CzB---------- Cozad	Severe: flooding.	Slight----------	Moderate: slope.	Slight.
Fu*. Fluvaquents				
Gn---------- Gibbon	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Gs*:				
Gibbon----------	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Saltine----------	Severe: flooding, excess sodium, excess salt.	Severe: excess sodium, excess salt.	Severe: excess sodium, excess salt.	Slight.
Ha, Hb---------- Hall	Slight----------	Slight----------	Slight----------	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
HeC: Hersh	Slight	Slight	Moderate: slope.	Slight.
HgF*:				
Hersh	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Valentine	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too sandy.
Hk: Hobbs	Severe: flooding.	Slight	Moderate: flooding.	Slight.
HmB: Hobbs	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.
Ho: Holdrege	Slight	Slight	Slight	Slight.
HoB, HoC, HpC2: Holdrege	Slight	Slight	Moderate: slope.	Slight.
Ht: Hord	Severe: flooding.	Slight	Slight	Slight.
HtB: Hord	Slight	Slight	Moderate: slope.	Slight.
IpB: Ipage	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy.
LbB: Libory	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.	Moderate: wetness, too sandy.
Lo: Loup	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Lp: Loup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RsB: Ronson	Slight	Slight	Slight	Slight.
Sc: Scott	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.
UbD, UbE: Uly	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight.
UcF*:				
Uly	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails
UtG*. Ustorthents				
VaE------------------ Valentine	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.
VbD------------------ Valentine	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.
VeC*:				
Valentine------------	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
Bolent---------------	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Wa------------------- Wann	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
An----------------- Anselmo	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Ba----------------- Barney	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
Bp----------------- Boel	Fair	Fair	Good	Good	Good	Good	Fair	Fair	Fair	Good	Fair	Good.
BrB---------------- Boelus	Fair	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
Bt----------------- Bolent	Poor	Fair	Good	Good	Good	Good	Fair	Very poor.	Fair	Good	Poor	Good.
CrG*:												
Coly---------------	Very poor.	Very poor.	Poor	Poor	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Hobbs--------------	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
CuD2*:												
Coly---------------	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Uly----------------	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
CuE2*:												
Coly---------------	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Uly----------------	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Cz, CzB------------ Cozad	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
Fu*. Fluvaquents												
Gn----------------- Gibbon	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Gs*:												
Gibbon-------------	Good	Good	Good	Good	Fair	Good	Fair	Good	Good	Good	Fair	Good.
Saltine------------	Poor	Poor	Good	Poor	Poor	Poor	Good	Good	Poor	Poor	Good	Poor.
Ha, Hb------------- Hall	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
HeC---------------- Hersh	Fair	Good	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements								Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
HgF*:												
Hersh	Poor	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
Hk Hobbs	Good	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor	Good.
HmB Hobbs	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
Ho, HoB Holdrege	Good	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Good	Good	Very poor.	Fair.
HoC, HpC2 Holdrege	Fair	Good	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Fair.
Ht, HtB Hord	Good	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.	Good.
IpB Ipage	Poor	Good	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair	Fair.
LbB Libory	Fair	Fair	Good	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.	Good.
Lo, Lp Loup	Very poor.	Poor	Fair	Poor	Poor	Fair	Good	Good	Poor	Poor	Good	Fair.
RsB Ronson	Fair	Fair	Good	Poor	Very poor.	---	Very poor.	Very poor.	Fair	Very poor.	Very poor.	Good.
Sc Scott	Poor	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good	Fair.
UbD, UbE Uly	Fair	Good	Good	Good	Fair	Fair	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
UcF*:												
Uly	Poor	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
Coly	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	Fair.
UtG*. Ustorthents												
VaE Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VbD Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.
VeC*:												
Valentine	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
VeC*:												
Bolent	Poor	Fair	Good	Good	Good	Good	Fair	Very poor.	Fair	Good	Poor	Good.
Wa, Wann	Good	Good	Good	Good	Fair	Good	Poor	Fair	Good	Good	Fair	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
An: Anselmo	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
Ba: Barney	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.
Bp: Boel	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
BrB: Boelus	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Bt: Bolent	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: wetness, droughty, flooding.
CrG*:						
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
CuD2*, CuE2*:						
Coly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Cz, CzB: Cozad	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Fu*. Fluvaquents						
Gn: Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.
Gs*:						
Gibbon	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Gs*:						
Saltine	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Severe: excess salt, excess sodium.
Ha, Hb Hall	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HeC Hersh	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
HgF*:						
Hersh	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Valentine	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hk Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Moderate: flooding.
HmB Hobbs	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
Ho, HoB Holdrege	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
HoC, HpC2 Holdrege	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
Ht Hord	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength.	Slight.
HtB Hord	Slight	Slight	Slight	Slight	Severe: low strength.	Slight.
IpB Ipage	Severe: cutbanks cave.	Slight	Moderate: wetness.	Slight	Moderate: frost action.	Severe: droughty.
LbB Libory	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Lo Loup	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.
Lp Loup	Severe: cutbanks cave, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.
RsB Ronson	Slight	Slight	Slight	Slight	Moderate: frost action.	Moderate: droughty, thin layer.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Sc------------------ Scott	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
UbD, UbE---------- Uly	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
UcF*:						
Uly---------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Coly--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UtG*. Ustorthents						
VaE--------------- Valentine	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
VbD--------------- Valentine	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
VeC*:						
Valentine---------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Moderate: droughty.
Bolent------------	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding, frost action.	Moderate: wetness, droughty.
Wa---------------- Wann	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: frost action.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
An: Anselmo	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ba: Barney	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy, wetness.
Bp: Boel	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
BrB: Boelus	Moderate: percs slowly.	Severe: seepage.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
Bt: Bolent	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
CrG*:					
Coly	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
CuD2*, CuE2*:					
Coly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Cz: Cozad	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
CzB: Cozad	Moderate: flooding.	Moderate: seepage, slope.	Moderate: flooding.	Moderate: flooding.	Good.
Fu*. Fluvaquents					
Gn: Gibbon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.
Gs*:					
Gibbon	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Gs*:					
Saltine	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: excess salt, excess sodium.
Ha, Hb Hall	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: too clayey.
HeC Hersh	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
HgF*:					
Hersh	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Valentine	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Hk, HmB Hobbs	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Fair: too clayey.
Ho Holdrege	Slight	Moderate: seepage.	Slight	Slight	Good.
HoB, HoC, HpC2 Holdrege	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
Ht Hord	Moderate: flooding.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
HtB Hord	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
IpB Ipage	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
LbB Libory	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: wetness.	Severe: seepage.	Fair: too clayey, wetness.
Lo Loup	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
Lp Loup	Severe: ponding, poor filter.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
RsB Ronson	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sc-------------------- Scott	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
UbD, UbE------------- Uly	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
UcF*:					
Uly-----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Coly----------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
UtG*. Ustorthents					
VaE------------------ Valentine	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
VbD------------------ Valentine	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
VeC*:					
Valentine-----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Bolent--------------	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Wa------------------- Wann	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: wetness, thin layer.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
An------------------- Anselmo	Good----------------	Probable------------	Improbable: too sandy.	Fair: thin layer.
Ba------------------- Barney	Poor: wetness.	Probable------------	Improbable: too sandy.	Poor: area reclaim, wetness.
Bp------------------- Boel	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
BrB------------------ Boelus	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Bt------------------- Bolent	Fair: wetness.	Probable------------	Improbable: too sandy.	Poor: too sandy.
CrG*:				
Coly-----------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hobbs----------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CuD2*, CuE2*:				
Coly-----------------	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Uly------------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Cz, CzB-------------- Cozad	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
Fu*. Fluvaquents				
Gn------------------- Gibbon	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Gs*:				
Gibbon---------------	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Saltine--------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt, excess sodium.
Ha, Hb--------------- Hall	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
HeC------------------ Hersh	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HgF*:				
Hersh	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Valentine	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
Hk, HmB: Hobbs	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ho, HoB, HoC: Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HpC2: Holdrege	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ht, HtB: Hord	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
IpB: Ipage	Good	Probable	Improbable: too sandy.	Poor: too sandy.
LbB: Libory	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too sandy.
Lo: Loup	Poor: wetness.	Probable	Improbable: too sandy.	Poor: too sandy, wetness.
Lp: Loup	Poor: wetness.	Probable	Improbable: too sandy.	Poor: wetness.
RsB: Ronson	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Sc: Scott	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
UbD, UbE: Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
UcF*:				
Uly	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Coly	Fair: slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
UtG*. Ustorthents				
VaE: Valentine	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope, too sandy.
VbD: Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
VeC*:				
Valentine	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Bolent	Fair: wetness.	Probable	Improbable: too sandy.	Poor: too sandy.
Wa Wann	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "moderate" and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--* Pond reservoir areas	Limitations for--* Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
An---------------- Anselmo	Severe: seepage.	Severe: seepage, piping.	Deep to water	Favorable------	Too sandy, soil blowing.	Favorable.
Ba---------------- Barney	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Bp---------------- Boel	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, soil blowing.	Wetness, too sandy.	Droughty.
BrB--------------- Boelus	Severe: seepage.	Moderate: piping.	Deep to water	Fast intake, soil blowing.	Erodes easily, soil blowing.	Erodes easily.
Bt---------------- Bolent	Severe: seepage.	Severe: seepage, piping, wetness.	Flooding, cutbanks cave.	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
CrG*:						
Coly--------------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Hobbs-------------	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, flooding.	Favorable------	Favorable.
CuD2*, CuE2*:						
Coly--------------	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Uly---------------	Severe: slope.	Severe: piping.	Deep to water	Slope-----------	Slope, erodes easily.	Slope, erodes easily.
Cz, CzB----------- Cozad	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Erodes easily	Erodes easily.
Fu*. Fluvaquents						
Gn---------------- Gibbon	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Favorable.
Gs*:						
Gibbon------------	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness--------	Wetness--------	Favorable.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Gs*:						
Saltine	Moderate: seepage.	Severe: excess sodium, excess salt, piping.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness	Excess salt, excess sodium, percs slowly.
Ha, Hb Hall	Severe: seepage.	Severe: thin layer.	Deep to water	Favorable	Erodes easily	Erodes easily.
HeC Hersh	Severe: seepage.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing	Favorable.
HgF*:						
Hersh	Severe: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Slope, soil blowing.	Slope.
Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Hk, HmB Hobbs	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Favorable	Favorable.
Ho, HoB Holdrege	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
HoC, HpC2 Holdrege	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
Ht, HtB Hord	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
IpB Ipage	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Too sandy, soil blowing.	Droughty.
LbB Libory	Severe: seepage.	Severe: piping.	Favorable	Wetness, droughty, fast intake.	Erodes easily, wetness, soil blowing.	Erodes easily, droughty.
Lo Loup	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty.	Wetness, too sandy.	Wetness, droughty.
Lp Loup	Severe: seepage.	Severe: seepage, piping, ponding.	Ponding, cutbanks cave.	Ponding, droughty.	Ponding, too sandy.	Wetness, droughty.
RsB Ronson	Severe: seepage.	Moderate: thin layer.	Deep to water	Droughty, soil blowing.	Area reclaim, soil blowing.	Droughty, area reclaim.
Sc Scott	Moderate: seepage.	Severe: hard to pack, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Not needed	Not needed.
UbD, UbE Uly	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
UcF*:						
Uly	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope, erodes easily.	Slope, erodes easily.
Coly	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
UtG*. Ustorthents						
VaE Valentine	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
VbD Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
VeC*:						
Valentine	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Bolent	Severe: seepage.	Severe: seepage, piping, wetness.	Cutbanks cave	Wetness, droughty, fast intake.	Wetness, too sandy, soil blowing.	Droughty, rooting depth.
Wa Wann	Severe: seepage.	Severe: piping, wetness.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Favorable.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
An---------------- Anselmo	0-8	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	100	100	60-100	30-65	<25	NP-7
	8-29	Fine sandy loam, loam.	SM, ML, SM-SC, CL-ML	A-4	0	100	100	90-100	35-65	<25	NP-7
	29-60	Fine sandy loam, loamy very fine sand, fine sand.	SM, SP-SM, SM-SC	A-4, A-2	0	100	100	65-100	12-45	<25	NP-7
Ba---------------- Barney	0-8	Loam-------------	ML, CL, CL-ML	A-4, A-6	0	90-100	90-100	85-95	60-95	20-35	3-15
	8-60	Coarse sand, sand, fine sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	90-100	85-100	30-70	3-15	---	NP
Bp---------------- Boel	0-15	Fine sandy loam	SM	A-4, A-2	0	100	100	85-95	20-40	<20	NP
	15-60	Fine sand, loamy fine sand, coarse sand.	SP, SM	A-2, A-3	0	100	95-100	85-95	0-25	---	NP
BrB-------------- Boelus	0-12	Loamy fine sand	SM, SP-SM	A-2	0	100	100	50-100	10-35	<20	NP
	12-26	Loamy fine sand, loamy sand, sand.	SM, SP-SM	A-2	0	100	100	50-100	10-35	<20	NP
	26-60	Silt loam, loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	30-40	8-15
Bt---------------- Bolent	0-7	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-80	5-25	<20	NP
	7-60	Stratified sand to loamy fine sand.	SM, SP, SP-SM	A-2, A-3, A-1	0	85-100	80-100	40-70	3-35	---	NP
CrG*: Coly-------------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	85-100	20-45	2-20
	4-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
Hobbs------------	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	10-60	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-55	5-25
CuD2*, CuE2*: Coly-------------	0-4	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	85-100	20-45	2-20
	4-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
Uly--------------	0-5	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	5-16	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	16-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Cz, CzB---------- Cozad	0-14	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	100	75-100	20-35	2-12
	14-24	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-95	20-35	2-12
	24-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	95-100	80-100	50-100	20-35	2-12
Fu*. Fluvaquents											
Gn--------------- Gibbon	0-14	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	14-60	Silt loam, clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	80-90	25-38	12-20
Gs*: Gibbon----------	0-15	Silt loam--------	ML, CL, CL-ML	A-4	0	100	100	85-100	70-90	20-30	2-10
	15-60	Silt loam, clay loam, silty clay loam.	CL	A-6	0	100	100	90-100	80-90	25-38	12-20
Saltine---------	0-7	Silt loam--------	ML	A-4	0	95-100	95-100	85-100	60-90	25-35	3-10
	7-22	Silt loam, silty clay loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	95-100	95-100	85-100	60-100	25-50	5-25
	22-60	Silty clay loam, silt loam, loam.	CL, CH, ML, CL-ML	A-4, A-6, A-7	0	95-100	95-100	95-100	70-95	25-55	5-35
Ha--------------- Hall	0-16	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	95-100	25-40	3-18
	16-42	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-30
	42-60	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-20
Hb--------------- Hall	0-15	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	100	95-100	95-100	25-40	3-18
	15-42	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	95-100	35-50	15-30
	42-60	Silt loam--------	CL, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-40	5-20
HeC-------------- Hersh	0-8	Fine sandy loam	SM, SC, SM-SC, ML	A-4	0	100	100	85-100	40-75	<25	NP-10
	8-14	Fine sandy loam, loamy very fine sand.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-100	40-65	<20	NP-5
	14-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4, A-2	0	100	100	80-100	25-50	<20	NP-5
HgF*: Hersh-----------	0-5	Fine sandy loam	SM, SC, SM-SC, ML	A-4	0	100	100	85-100	40-75	<25	NP-10
	5-11	Fine sandy loam, loamy very fine sand.	SM, SM-SC, ML, CL-ML	A-4	0	100	100	80-100	40-65	<20	NP-5
	11-60	Fine sandy loam, loamy fine sand, loamy very fine sand.	SM, SM-SC	A-4, A-2	0	100	100	80-100	25-50	<20	NP-5

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HgF*:											
Valentine-------	0-4	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	4-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-35	---	NP
Hk, HmB---------- Hobbs	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	85-100	25-40	5-20
	7-60	Silt loam, silty clay loam, very fine sandy loam.	CL, CL-ML, MH	A-4, A-6, A-7	0	100	100	95-100	80-100	25-55	5-25
Ho, HoB, HoC----- Holdrege	0-12	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	95-100	85-100	20-45	2-20
	12-24	Silty clay loam	CL, CH	A-7, A-6	0	100	100	98-100	90-100	30-55	15-35
	24-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
HpC2------------ Holdrege	0-5	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	85-100	30-50	15-35
	5-19	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	95-100	95-100	25-40	9-17
	19-60	Silt loam--------	CL, ML	A-4, A-6	0	100	100	95-100	90-100	30-40	5-15
Ht, HtB---------- Hord	0-16	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-100	20-35	3-18
	16-36	Silt loam, silty clay loam.	CL	A-6, A-4	0	100	100	98-100	85-100	25-40	8-23
	36-60	Silt loam, very fine sandy loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	100	85-100	25-40	6-21
IpB------------- Ipage	0-6	Loamy fine sand	SM, SP-SM	A-2	0	100	100	50-90	10-35	---	NP
	6-60	Fine sand, loamy fine sand, sand.	SM, SP-SM, SP	A-2, A-3	0	100	95-100	50-100	2-30	---	NP
LbB------------- Libory	0-14	Loamy fine sand	SM	A-2, A-4	0	100	100	65-85	15-45	---	NP
	14-32	Loamy fine sand, loamy sand, fine sand.	SM, SP-SM	A-2	0	100	100	55-80	12-35	---	NP
	32-60	Silty clay loam, silt loam, very fine sandy loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-95	20-40	4-24
Lo-------------- Loup	0-10	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	100	70-95	20-50	<20	NP-6
	10-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	95-100	95-100	65-100	5-20	---	NP
Lp-------------- Loup	0-13	Loam------------	CL, CL-ML	A-4, A-6	0	100	100	90-100	55-80	15-35	4-15
	13-60	Fine sand, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	100	100	65-100	5-20	---	NP
RsB------------- Ronson	0-8	Fine sandy loam	SM, SM-SC	A-2, A-4	0	100	95-100	60-95	25-45	15-30	NP-7
	8-27	Fine sandy loam, sandy loam.	SM, SC, SM-SC	A-2, A-4	0	100	100	60-90	25-45	15-30	NP-10
	27-60	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Sc------------- Scott	0-16	Silty clay loam	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	16-40	Silty clay, clay	CH, CL	A-7	0	100	100	100	95-100	41-75	20-45
	40-60	Silt loam, silty clay loam, clay loam.	CL	A-4, A-6, A-7	0	100	100	90-100	90-100	25-50	8-24
UbD, UbE--------- Uly	0-11	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	11-21	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	21-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
UcF*:											
Uly-------------	0-11	Silt loam--------	ML, CL	A-4, A-6	0	100	100	100	95-100	20-40	2-20
	11-20	Silt loam, silty clay loam.	ML, CL	A-4, A-6	0	100	100	100	95-100	25-40	3-15
	20-60	Silt loam, very fine sandy loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	25-40	3-15
Coly------------	0-5	Silt loam--------	ML, CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	85-100	20-45	2-20
	5-60	Silt loam, very fine sandy loam.	ML, CL, CL-ML	A-4, A-6	0	100	100	85-100	85-100	20-40	2-15
UtG*. Ustorthents											
VaE-------------- Valentine	0-8	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	70-100	2-25	---	NP
	8-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-35	---	NP
VbD-------------- Valentine	0-7	Loamy fine sand	SM, SP-SM, SP	A-2, A-3	0	100	100	95-100	2-35	---	NP
	7-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-35	---	NP
VeC*:											
Valentine-------	0-5	Fine sand--------	SM, SP-SM, SP	A-2, A-3	0	100	100	70-100	2-25	---	NP
	5-60	Fine sand, loamy fine sand, loamy sand.	SM, SP-SM, SP	A-2, A-3	0	100	100	90-100	2-35	---	NP
Bolent----------	0-6	Loamy sand-------	SM, SP-SM	A-2, A-3	0	95-100	95-100	60-80	5-25	<20	NP
	6-60	Stratified fine sand to loamy sand.	SM, SP, SP-SM	A-2, A-3, A-1	0	85-100	80-100	40-70	3-35	---	NP
Wa-------------- Wann	0-15	Fine sandy loam	SM, SM-SC	A-2, A-4	0	95-100	95-100	70-100	30-50	<25	NP-5
	15-27	Sandy loam, fine sandy loam.	SM, SM-SC	A-2, A-4	0	95-100	75-100	60-100	20-50	<25	NP-5
	27-60	Stratified sandy clay loam to fine sand.	SM	A-2, A-4	0	95-100	95-100	70-100	15-40	<20	NP-3

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
An: Anselmo	0-8	10-18	1.30-1.60	0.6-6.0	0.13-0.18	5.6-7.8	<2	Low	0.20	5	3	1-2
	8-29	10-18	1.40-1.60	2.0-6.0	0.15-0.19	5.6-7.8	<2	Low	0.20			
	29-60	5-18	1.50-1.70	2.0-6.0	0.08-0.16	5.6-7.8	<2	Low	0.20			
Ba: Barney	0-8	10-20	1.40-1.50	0.6-2.0	0.20-0.24	6.6-8.4	<2	Low	0.28	5	4L	2-4
	8-60	0-5	1.70-1.90	6.0-20	0.02-0.04	6.6-7.8	<2	Low	0.10			
Bp: Boel	0-15	8-18	1.50-1.70	2.0-6.0	0.16-0.18	6.1-8.4	<2	Low	0.20	5	3	1-2
	15-60	0-6	1.50-1.60	6.0-20	0.05-0.10	6.6-8.4	<2	Low	0.20			
BrB: Boelus	0-12	2-12	1.50-1.70	6.0-20	0.10-0.12	5.6-7.3	<2	Low	0.17	5	2	1-2
	12-26	2-12	1.50-1.70	6.0-20	0.09-0.11	6.1-7.8	<2	Low	0.17			
	26-60	15-35	1.40-1.60	0.6-2.0	0.17-0.22	6.1-8.4	<2	Moderate	0.43			
Bt: Bolent	0-7	3-10	1.40-1.60	6.0-20	0.10-0.12	7.4-8.4	<2	Low	0.17	5	2	.5-1
	7-60	1-10	1.50-1.80	6.0-20	0.05-0.10	6.6-8.4	<2	Low	0.15			
CrG*:												
Coly	0-4	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low	0.43	5	4L	1-2
	4-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.43			
Hobbs	0-10	15-27	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low	0.32	5	6	2-4
	10-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low	0.32			
CuD2*, CuE2*:												
Coly	0-4	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low	0.43	5	4L	.5-1
	4-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low	0.43			
Uly	0-5	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low	0.32	5	6	1-3
	5-16	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low	0.43			
	16-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low	0.43			
Cz, CzB: Cozad	0-14	11-25	1.30-1.40	0.6-2.0	0.20-0.22	6.1-7.3	<2	Low	0.32	5	6	1-2
	14-24	10-18	1.30-1.40	0.6-2.0	0.17-0.19	6.1-8.4	<2	Low	0.43			
	24-60	8-18	1.20-1.50	0.6-2.0	0.15-0.19	6.6-8.4	<2	Low	0.24			
Fu*. Fluvaquents												
Gn: Gibbon	0-14	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Low	0.32	5	4L	2-4
	14-60	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
Gs*:												
Gibbon	0-15	20-25	1.40-1.60	0.6-2.0	0.21-0.23	7.4-8.4	<2	Low	0.32	5	4L	2-4
	15-60	20-27	1.30-1.50	0.6-2.0	0.18-0.22	7.9-8.4	<2	Moderate	0.32			
Saltine	0-7	15-27	1.30-1.40	0.6-2.0	0.20-0.24	>7.3	>4	Low	0.32	5	4L	1-2
	7-22	20-40	1.20-1.30	0.6-2.0	0.17-0.22	>8.4	>4	Moderate	0.32			
	22-60	20-45	1.30-1.40	0.2-0.6	0.16-0.22	>7.3	<2	High	0.32			
Ha: Hall	0-16	20-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	16-42	28-35	1.30-1.50	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	42-60	15-27	1.30-1.40	0.6-2.0	0.18-0.22	6.6-8.4	<2	Moderate	0.43			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
Hb----------------- Hall	0-15	20-27	1.30-1.40	0.6-2.0	0.20-0.24	6.1-7.3	<2	Moderate	0.32	5	6	2-4
	15-42	28-35	1.30-1.50	0.6-2.0	0.18-0.20	6.1-7.8	<2	Moderate	0.43			
	42-60	15-27	1.30-1.40	0.6-2.0	0.18-0.22	6.6-7.8	<2	Moderate	0.43			
HeC---------------- Hersh	0-8	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low--------	0.24	5	3	.5-1
	8-14	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low--------	0.24			
	14-60	10-18	1.20-1.50	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low--------	0.24			
HgF*:												
Hersh------------	0-5	10-18	1.30-1.50	2.0-6.0	0.16-0.18	6.1-7.3	<2	Low--------	0.24	5	3	.5-1
	5-11	8-18	1.30-1.50	2.0-6.0	0.15-0.18	6.1-7.3	<2	Low--------	0.24			
	11-60	10-18	1.20-1.50	2.0-6.0	0.10-0.16	6.6-7.8	<2	Low--------	0.24			
Valentine--------	0-4	2-10	1.70-1.90	6.0-20	0.10-0.12	5.6-7.3	<2	Low--------	0.17	5	2	.5-1
	4-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
Hk, HmB----------- Hobbs	0-7	15-27	1.20-1.40	0.6-2.0	0.21-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	7-60	15-30	1.20-1.40	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.32			
Ho, HoB, HoC------ Holdrege	0-12	15-25	1.40-1.60	0.6-2.0	0.22-0.24	5.6-7.3	<2	Moderate	0.32	5	6	2-4
	12-24	28-35	1.20-1.40	0.6-2.0	0.18-0.20	6.6-7.8	<2	Moderate	0.43			
	24-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
HpC2-------------- Holdrege	0-5	28-35	1.40-1.60	0.6-2.0	0.21-0.23	5.6-7.3	<2	Moderate	0.32	5	7	1-2
	5-19	18-30	1.30-1.50	0.6-2.0	0.17-0.20	6.6-7.8	<2	Moderate	0.43			
	19-60	15-20	1.40-1.60	0.6-2.0	0.20-0.22	6.6-8.4	<2	Moderate	0.43			
Ht, HtB----------- Hord	0-16	17-27	1.30-1.40	0.6-2.0	0.20-0.24	5.6-7.3	<2	Low--------	0.32	5	6	2-4
	16-36	20-35	1.35-1.45	0.6-2.0	0.17-0.22	6.1-7.8	<2	Low--------	0.32			
	36-60	18-30	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
IpB---------------- Ipage	0-6	3-10	1.40-1.50	6.0-20	0.10-0.12	5.1-7.8	<2	Low--------	0.17	5	2	.5-1
	6-60	1-8	1.50-1.60	6.0-20	0.04-0.10	5.1-7.8	<2	Low--------	0.15			
LbB---------------- Libory	0-14	2-12	1.50-1.70	6.0-20	0.07-0.12	5.6-7.3	<2	Low--------	0.17	5	2	1-2
	14-32	2-12	1.50-1.70	6.0-20	0.06-0.11	5.6-7.3	<2	Low--------	0.17			
	32-60	15-32	1.20-1.40	0.6-2.0	0.17-0.22	5.6-7.8	<2	Low--------	0.43			
Lo----------------- Loup	0-10	5-15	1.30-1.50	2.0-6.0	0.16-0.18	6.6-8.4	<2	Low--------	0.20	5	8	4-8
	10-60	2-7	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
Lp----------------- Loup	0-13	8-18	1.10-1.30	0.6-2.0	0.20-0.22	6.6-8.4	<2	Low--------	0.28	5	8	4-8
	13-60	2-7	1.50-1.70	6.0-20	0.06-0.08	6.6-8.4	<2	Low--------	0.17			
RsB---------------- Ronson	0-8	10-18	1.30-1.40	2.0-6.0	0.11-0.17	6.1-8.4	<2	Low--------	0.20	4	3	1-2
	8-27	10-18	1.35-1.45	2.0-6.0	0.09-0.15	7.4-8.4	<2	Low--------	0.20			
	27-60	---	---	---	---	---	---	-----------	----			
Sc----------------- Scott	0-16	27-35	1.15-1.30	0.6-2.0	0.21-0.24	5.6-7.3	<2	Moderate	0.37	3	7	2-4
	16-40	40-55	1.20-1.40	<0.06	0.10-0.14	5.6-7.8	<2	High-------	0.37			
	40-60	18-35	1.30-1.50	0.6-2.0	0.14-0.22	6.6-7.8	<2	Moderate	0.37			
UbD, UbE---------- Uly	0-11	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	11-21	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	21-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Soil reaction	Salinity	Shrink- swell potential	Erosion factors K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH	mmhos/cm					Pct
UcF*:												
Uly-------------	0-11	17-27	1.20-1.30	0.6-2.0	0.20-0.24	6.1-7.8	<2	Low--------	0.32	5	6	2-4
	11-20	20-30	1.20-1.30	0.6-2.0	0.18-0.22	6.1-8.4	<2	Low--------	0.43			
	20-60	18-27	1.10-1.20	0.6-2.0	0.18-0.22	7.4-8.4	<2	Low--------	0.43			
Coly------------	0-5	18-24	1.30-1.50	0.6-2.0	0.20-0.24	7.4-8.4	<2	Low--------	0.43	5	4L	1-2
	5-60	18-24	1.30-1.50	0.6-2.0	0.17-0.22	7.4-8.4	<2	Low--------	0.43			
UtG*. Ustorthents												
VaE--------------- Valentine	0-8	0-6	1.70-1.90	6.0-20	0.07-0.09	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	8-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
VbD--------------- Valentine	0-7	2-10	1.70-1.90	6.0-20	0.10-0.12	5.6-7.3	<2	Low--------	0.17	5	2	.5-1
	7-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
VeC*:												
Valentine--------	0-5	0-6	1.70-1.90	6.0-20	0.07-0.09	5.6-7.3	<2	Low--------	0.15	5	1	.5-1
	5-60	0-8	1.70-1.90	6.0-20	0.05-0.11	5.6-7.3	<2	Low--------	0.15			
Bolent-----------	0-6	3-10	1.40-1.60	6.0-20	0.10-0.12	7.4-8.4	<2	Low--------	0.17	5	2	.5-1
	6-60	1-10	1.50-1.80	6.0-20	0.05-0.10	6.6-8.4	<2	Low--------	0.15			
Wa---------------- Wann	0-15	5-15	1.40-1.60	2.0-6.0	0.13-0.18	6.6-8.4	<2	Low--------	0.20	5	3	1-2
	15-27	3-18	1.40-1.65	2.0-6.0	0.11-0.17	7.4-8.4	<2	Low--------	0.20			
	27-60	3-22	1.40-1.60	2.0-6.0	0.09-0.12	7.4-8.4	<2	Low--------	0.15			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
An: Anselmo	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Ba: Barney	D	Frequent	Long	Mar-Jun	0-2.0	Apparent	Nov-Jun	>60	---	Moderate	High	Low.
Bp: Boel	A	Rare	---	---	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	High	Low.
BrB: Boelus	A	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
Bt: Bolent	A	Occasional	Brief	Mar-Jun	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	Low	Low.
CrG*:												
Coly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Hobbs	B	Occasional	Brief	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low	Low.
CuD2*, CuE2*:												
Coly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Uly	B	None	---	---	>6.0	---	---	>60	---	Moderate	High	Low.
Cz, CzB: Cozad	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.
Fu*. Fluvaquents												
Gn: Gibbon	B	Rare	---	---	1.5-3.0	Apparent	Nov-Jun	>60	---	High	High	Low.
Gs*:												
Gibbon	B	Rare	---	---	2.0-3.0	Apparent	Nov-Jun	>60	---	High	High	Low.
Saltine	C	Rare	---	---	2.0-3.0	Apparent	Nov-Jul	>60	---	High	High	High.
Ha, Hb: Hall	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
HeC: Hersh	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
HqF*:												
Hersh------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Valentine--------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Hk---------------- Hobbs	B	Occasional	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
HmB--------------- Hobbs	B	Frequent----	Brief-----	Apr-Sep	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ho, HoB, HoC, HpC2------------- Holdrege	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ht---------------- Hord	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
HtB--------------- Hord	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
IpB--------------- Ipage	A	None--------	---	---	3.0-6.0	Apparent	Dec-Jun	>60	---	Moderate	Low------	Moderate.
LbB--------------- Libory	A	None--------	---	---	1.5-3.0	Perched	Mar-Jun	>60	---	Low------	Moderate	Low.
Lo---------------- Loup	D	Rare--------	---	---	0-1.5	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
Lp---------------- Loup	D	Rare--------	---	---	+.5-1.0	Apparent	Nov-May	>60	---	Moderate	High-----	Low.
RsB--------------- Ronson	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	Low.
Sc---------------- Scott	D	None--------	---	---	+.5-1.0	Perched	Mar-Aug	>60	---	High-----	High-----	Low.
UbD, UbE---------- Uly	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
UcF*:												
Uly---------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Coly--------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
UtG*. Ustorthents												

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
VaE, VbD---------- Valentine	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
VeC*:												
Valentine---------	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	Low.
Bolent------------	A	Rare---------	---	---	1.5-3.5	Apparent	Nov-May	>60	---	Moderate	Low-------	Low.
Wa----------------- Wann	B	Rare---------	---	---	1.5-3.5	Apparent	Mar-Jul	>60	---	High------	Moderate	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--ENGINEERING INDEX TEST DATA

(Dashes indicate data were not available. LL means liquid limit and PI, plasticity index)

Soil name,* report number, horizon, and depth in inches	Classification		Grain-size distribution										
			Percentage passing sieve--						Percentage smaller than--		LL	PI	Specific gravity
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.002** mm			
											Pct		g/cc
Coly silt loam: (S84NE163-144)													
A--------0 to 5	A-7-6(12)	CL, ML	---	---	---	---	100	97	87	20	44	18	2.59
AC-------5 to 10	A-6(9)	CL, ML	---	---	---	---	100	98	91	18	38	13	2.61
C2------22 to 60	A-4(8)	CL, ML	---	---	---	---	100	99	86	12	33	9	2.62
Cozad silt loam: (S84NE163-146)													
Ap-------0 to 7	A-4(8)	ML	---	---	---	---	100	95	63	18	32	8	2.59
Bw------14 to 24	A-4(8)	ML	---	---	---	---	100	94	65	18	31	6	2.60
C1------24 to 36	A-4(8)	ML	---	---	---	---	100	97	87	19	32	8	2.60
Holdrege silt loam: (S86NE163-221)													
Ap-------0 to 7	A-4(8)	CL	---	---	---	---	100	98	87	21	30	19	2.60
Bt2-----17 to 24	A-7-6(14)	CL	---	---	---	---	100	99	90	35	43	24	2.62
C-------32 to 60	A-6(10)	Cl	---	---	---	---	100	98	88	20	36	14	2.66
Saltine silt loam: (S85NE163-204)													
Ap-------0 to 7	A-4(8)	ML	---	100	99	98	96	88	82	18	35	10	2.60
Bw1------7 to 17	A-4(8)	ML	---	---	100	99	98	96	88	14	32	7	2.60
Bw2-----17 to 30	A-4(8)	ML	---	100	99	98	96	95	86	16	30	6	2.59
Uly silt loam: (S84NE163-145)													
A--------0 to 9	A-6(10)	CL	---	---	---	---	100	98	87	22	40	16	2.56
Bw-------9 to 17	A-6(9)	CL	---	---	---	---	100	99	77	20	37	13	2.61
C-------27 to 60	A-4(8)	ML	---	---	---	---	100	99	89	15	32	8	2.64

See footnotes at end of table.

TABLE 19.--ENGINEERING INDEX TEST DATA--Continued

Soil name,* report number, horizon, and depth in inches	Classification		Grain-size distribution								LL	PI	Specific gravity
			Percentage passing sieve--						Percentage smaller than--				
	AASHTO	Unified	3/4 inch	3/8 inch	No. 4	No. 10	No. 40	No. 200	.05 mm	.002** mm			
											Pct		g/cc
Valentine loamy fine sand: (S83NE163-98)													
A---------0 to 7	A-2-4(0)	SM	---	---	---	---	100	33	22	6	NP	NP	2.61
C1-------12 to 33	A-2-4(0)	SM	---	---	---	---	100	27	14	6	NP	NP	2.60

* Locations of the sampled pedons are as follows--

Coly silt loam: 150 feet north and 30 feet west of the southeast corner of sec. 19, T. 16 N., R. 14 W.

Cozad silt loam: 130 feet west and 1,900 feet south of the northeast corner of sec. 13, T. 16 N., R. 16 W.

Holdrege silt loam: 200 feet west and 2,100 feet south of the northeast corner of sec. 14, T. 13 N., R. 14 W.

Saltine silt loam: 120 feet north and 1,150 feet east of the southwest corner of sec. 19, T. 13 N., R. 14 W.

Uly silt loam: 2,200 feet east and 300 feet north of the southwest corner of sec. 19, T. 16 N., R. 14 W.

Valentine loamy fine sand: 150 feet north and 1,925 feet west of the southeast corner of sec. 11, T. 14 N., R. 14 W.

** The procedures used by the Nebraska Department of Roads to determine the percent of clay differ from those used by the National Soil Survey Laboratory and may result in clay percentages that are lower than the ones given for the same soil in table 17.

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Anselmo	Coarse-loamy, mixed, mesic Typic Haplustolls
Barney	Sandy, mixed, mesic Mollic Fluvaquents
Boel	Sandy, mixed, mesic Fluvaquentic Haplustolls
*Boelus	Sandy over loamy, mixed, mesic Udic Haplustolls
Bolent	Sandy, mixed, mesic Aquic Ustifluvents
Coly	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Cozad	Coarse-silty, mixed, mesic Fluventic Haplustolls
Fluvaquents	Sandy, mixed, mesic Mollic Fluvaquents
Gibbon	Fine-silty, mixed (calcareous), mesic Fluvaquentic Haplaquolls
Hall	Fine-silty, mixed, mesic Pachic Argiustolls
Hersh	Coarse-loamy, mixed, nonacid, mesic Typic Ustorthents
Hobbs	Fine-silty, mixed, nonacid, mesic Mollic Ustifluvents
*Holdrege	Fine-silty, mixed, mesic Typic Argiustolls
Hord	Fine-silty, mixed, mesic Cumulic Haplustolls
Ipage	Mixed, mesic Aquic Ustipsamments
Libory	Sandy over loamy, mixed, mesic Aquic Haplustolls
Loup	Sandy, mixed, mesic Typic Haplaquolls
Ronson	Coarse-loamy, mixed, mesic Entic Haplustolls
Saltine	Fine-silty, mixed (calcareous), mesic Typic Halaquepts
Scott	Fine, montmorillonitic, mesic Typic Argialbolls
Uly	Fine-silty, mixed, mesic Typic Haplustolls
Ustorthents	Fine-silty, mixed (calcareous), mesic Typic Ustorthents
Valentine	Mixed, mesic Typic Ustipsamments
Wann	Coarse-loamy, mixed, mesic Fluvaquentic Haplustolls

Interpretive Groups

INTERPRETIVE GROUPS

(Dashes indicate that the soil was not assigned to the interpretive group)

Soil name and map symbol	Land capability N	Land capability I	Prime farmland	Range site	Windbreak group
An Anselmo	IIe-3	IIe-8	Yes	Sandy	5
Ba Barney	VIw-7	---	---	Wetland	10
Bp Boel	IIIw-6	IIIw-11	---	Subirrigated	2S
BrB Boelus	IIIe-6	IIIe-10	---	Sandy	5
Bt Bolent	IVw-5	IVw-11	---	Subirrigated	2S
CrG	VIIe-9	---	---		
Coly				Thin Loess	10
Hobbs				Silty Overflow	1
CuD2	IVe-8	IVe-6	---		
Coly				Limy Upland	8
Uly				Silty	3
CuE2	VIe-8	---	---		
Coly				Limy Upland	8
Uly				Silty	3
Cz Cozad	IIc-1	I-6	Yes	Silty Lowland	1
CzB Cozad	IIe-1	IIe-6	Yes	Silty Lowland	1
Fu Fluvaquents	VIIIw-7	---	---	---	10
Gn Gibbon	IIw-4	IIw-6	Yes	Subirrigated	2S
Gs	IVs-1	IVs-6	---		
Gibbon				Subirrigated	2S
Saltine				Saline Subirrigated	9S
Ha Hall	IIc-1	I-4	Yes	Silty	3
Hb Hall	IIc-1	I-4	Yes	Silty Lowland	3
HeC Hersh	IIIe-3	IIIe-8	Yes	Sandy	5
HgF	VIe-3	---	---		10
Hersh				Sandy	
Valentine				Sands	
Hk Hobbs	IIw-3	IIw-6	Yes	Silty Overflow	1
HmB Hobbs	VIw-7	---	---	Silty Overflow	10

INTERPRETIVE GROUPS--Continued

Soil name and map symbol	Land capability N	Land capability I	Prime farmland	Range site	Windbreak group
Ho: Holdrege	IIc-1	I-4	Yes	Silty	3
HoB: Holdrege	IIe-1	IIe-4	Yes	Silty	3
HoC: Holdrege	IIIe-1	IIIe-4	Yes	Silty	3
HpC2: Holdrege	IIIe-8	IIIe-4	Yes	Silty	3
Ht: Hord	IIc-1	I-6	Yes	Silty Lowland	1
HtB: Hord	IIe-1	IIe-6	Yes	Silty Lowland	1
IpB: Ipage	IVe-5	IVe-11	---	Sandy Lowland	5
LbB: Libory	IIIe-6	IIIe-10	---	Sandy Lowland	5
Lo: Loup	Vw-7	---	---	Wet Subirrigated	2D
Lp: Loup	Vw-7	---	---	Wetland	10
RsB: Ronson	IIIe-3	IIIe-9	---	Sandy	6R
Sc: Scott	IVw-2	---	---	---	10
UbD: Uly	IVe-1	IVe-6	---	Silty	3
UbE: Uly	VIe-1	---	---	Silty	3
UcF:	VIe-1	---	---		10
Uly				Silty	
Coly				Limy Upland	
UtG: Ustorthents	VIIs-8	---	---	---	10
VaE: Valentine	VIe-5	---	---	Sands	7
VbD: Valentine	VIe-5	IVe-11	---	Sands	7
VeC:	VIe-5	IVe-11	---		
Valentine				Sands	7
Bolent				Subirrigated	2S
Wa: Wann	IIw-6	IIw-8	Yes	Subirrigated	2S

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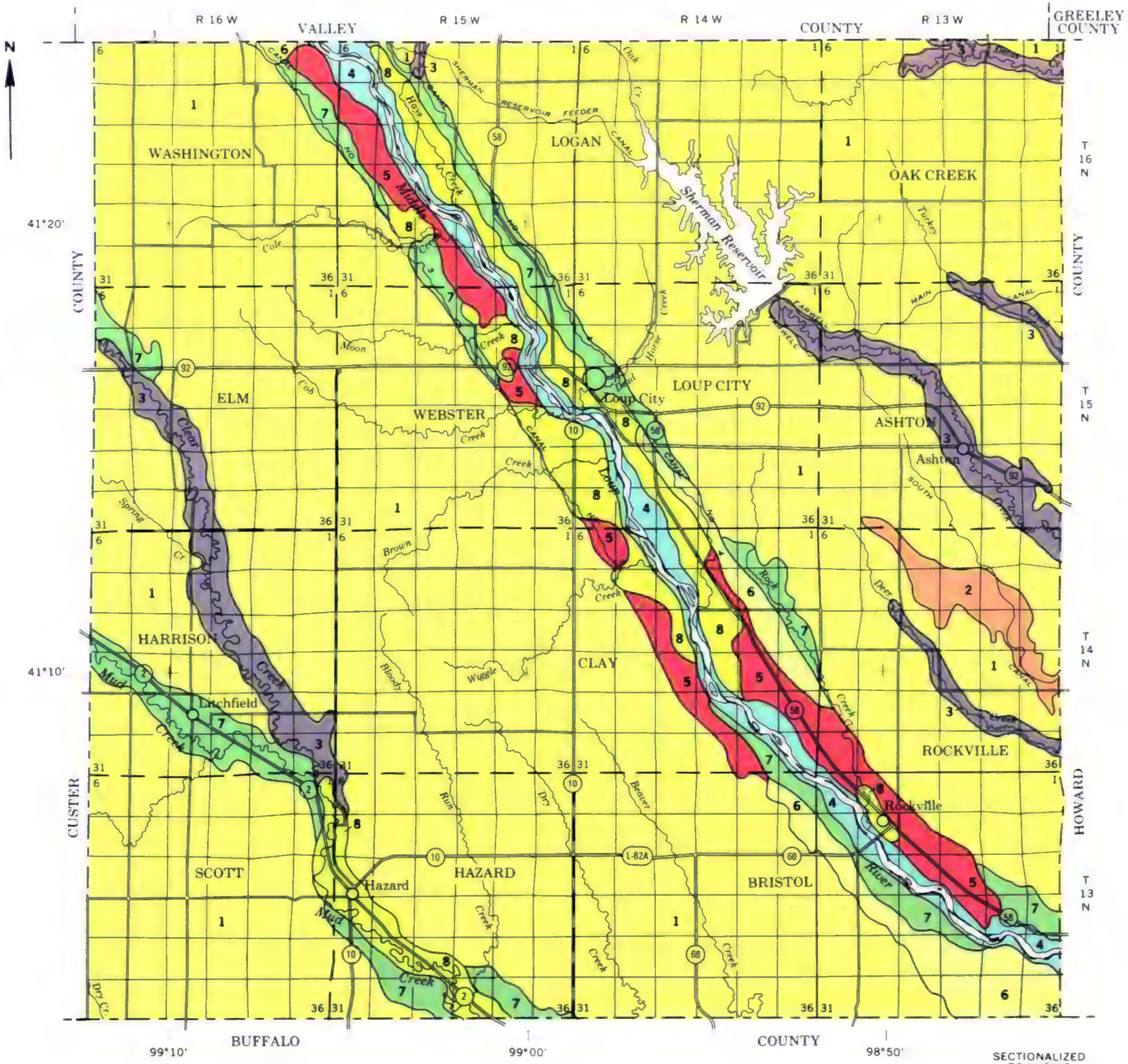


SOIL LEGEND*

1	ULY-COLY-HOLDREGE association: Deep, very gently sloping to very steep, well drained to excessively drained, silty soils; on uplands
2	HOLDREGE-ULY-COLY association: Deep, nearly level to steep, well drained and somewhat excessively drained, silty soils; on uplands
3	HORD-HOBBS association: Deep, nearly level and very gently sloping, well drained, silty soils; on bottom land and stream terraces
4	LOUP-BOLENT-BARNEY association: Deep, nearly level, very poorly drained to somewhat poorly drained, loamy and sandy soils; on bottom land
5	IPAGE-VALENTINE-LIBORY association: Deep, nearly level to moderately steep, moderately well drained and excessively drained, sandy soils; on stream terraces and uplands
6	VALENTINE-HERSH association: Deep, gently sloping to moderately steep, excessively drained and well drained, sandy and loamy soils; on uplands and stream terraces
7	COZAD-HORD association: Deep, nearly level and very gently sloping, well drained, silty soils; on stream terraces
8	GIBBON-WANN-SALTINE association: Deep, nearly level, somewhat poorly drained, silty and loamy soils; on bottom land

*Texture terms in the descriptive headings refer to the surface layer of the major soils in each association.

Compiled 1986

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

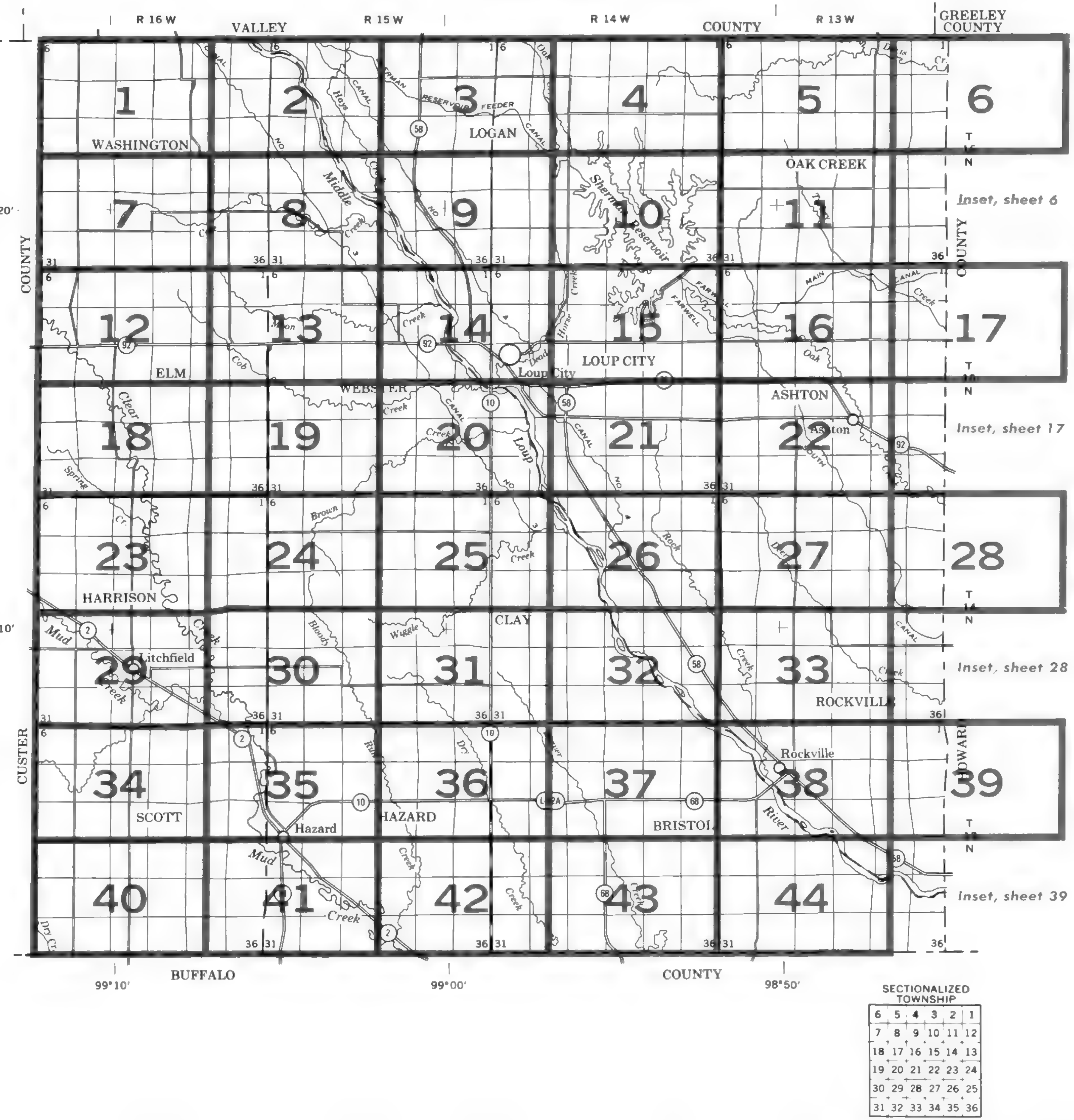
UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
UNIVERSITY OF NEBRASKA
CONSERVATION AND SURVEY DIVISION

GENERAL SOIL MAP
SHERMAN COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km



INDEX TO MAP SHEETS

SHERMAN COUNTY, NEBRASKA

Scale 1:190,080

1 0 1 2 3 Miles

1 0 3 6 Km

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded

SYMBOL	NAME
An	Anselmo fine sandy loam, 0 to 2 percent slopes
Ba	Barney loam, channeled, 0 to 2 percent slopes
Bp	Boel fine sandy loam, 0 to 2 percent slopes
BrB	Boelus loamy fine sand, 0 to 3 percent slopes
Bt	Bolent loamy sand, 0 to 2 percent slopes
CrG	Coly-Hobbs silt loams, 2 to 60 percent slopes
CuD2	Coly-Uly silt loams, 6 to 11 percent slopes, eroded
CuE2	Coly-Uly silt loams, 11 to 17 percent slopes, eroded
Cz	Cozad silt loam, terrace, 0 to 1 percent slopes
CzB	Cozad silt loam, terrace, 1 to 3 percent slopes
Fu	Fluvaquents, sandy
Gn	Gibbon silt loam, 0 to 1 percent slopes
Gs	Gibbon-Saltine silt loams, 0 to 1 percent slopes
Ha	Hall silt loam, 0 to 1 percent slopes
Hb	Hall silt loam, terrace, 0 to 1 percent slopes
HeC	Hersh fine sandy loam, 3 to 6 percent slopes
HgF	Hersh-Valentine complex, 9 to 24 percent slopes
Hk	Hobbs silt loam, 0 to 2 percent slopes
HmB	Hobbs silt loam, channeled, 0 to 3 percent slopes
Ho	Holdrege silt loam, 0 to 1 percent slopes
HoB	Holdrege silt loam, 1 to 3 percent slopes
HoC	Holdrege silt loam, 3 to 6 percent slopes
HpC2	Holdrege silty clay loam, 3 to 6 percent slopes, eroded
Ht	Hord silt loam, terrace, 0 to 1 percent slopes
HtB	Hord silt loam, terrace, 1 to 3 percent slopes
IpB	Ipage loamy fine sand, 0 to 3 percent slopes
LbB	Libory loamy fine sand, 0 to 3 percent slopes
Lo	Loup fine sandy loam, 0 to 2 percent slopes
Lp	Loup loam, wet, 0 to 2 percent slopes
RsB	Ronson fine sandy loam, 0 to 3 percent slopes
Sc	Scott silty clay loam, 0 to 1 percent slopes
UbD	Uly silt loam, 6 to 11 percent slopes
UbE	Uly silt loam, 11 to 17 percent slopes
UcF	Uly-Coly silt loams, 15 to 30 percent slopes
UtG	Ustorthents, steep
VaE	Valentine fine sand, rolling
VbD	Valentine loamy fine sand, 3 to 9 percent slopes
VeC	Valentine-Bolent complex, 0 to 6 percent slopes
Wa	Wann fine sandy loam, 0 to 1 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- County
- Reservation (national forest or park, state forest or park, and large airport)
- Field sheet matchline & neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, or cemetery — Davis Airstrip

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

- Other roads
- Trail

ROAD EMBLEMS & DESIGNATIONS

- State — 52
- County, farm or ranch — 378

RAILROAD

DAMS

- Large (to scale)
- Medium or small — water

PITS

- Gravel pit (up to 5 acres)

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Located object (label) — Tower
- Windmill

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
  - Double-line (label) — CANAL
  - Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial — water

MISCELLANEOUS WATER FEATURES

- Marsh (up to 3 acres)
- Wet spot (up to 3 acres)

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS — CuE2 UbD

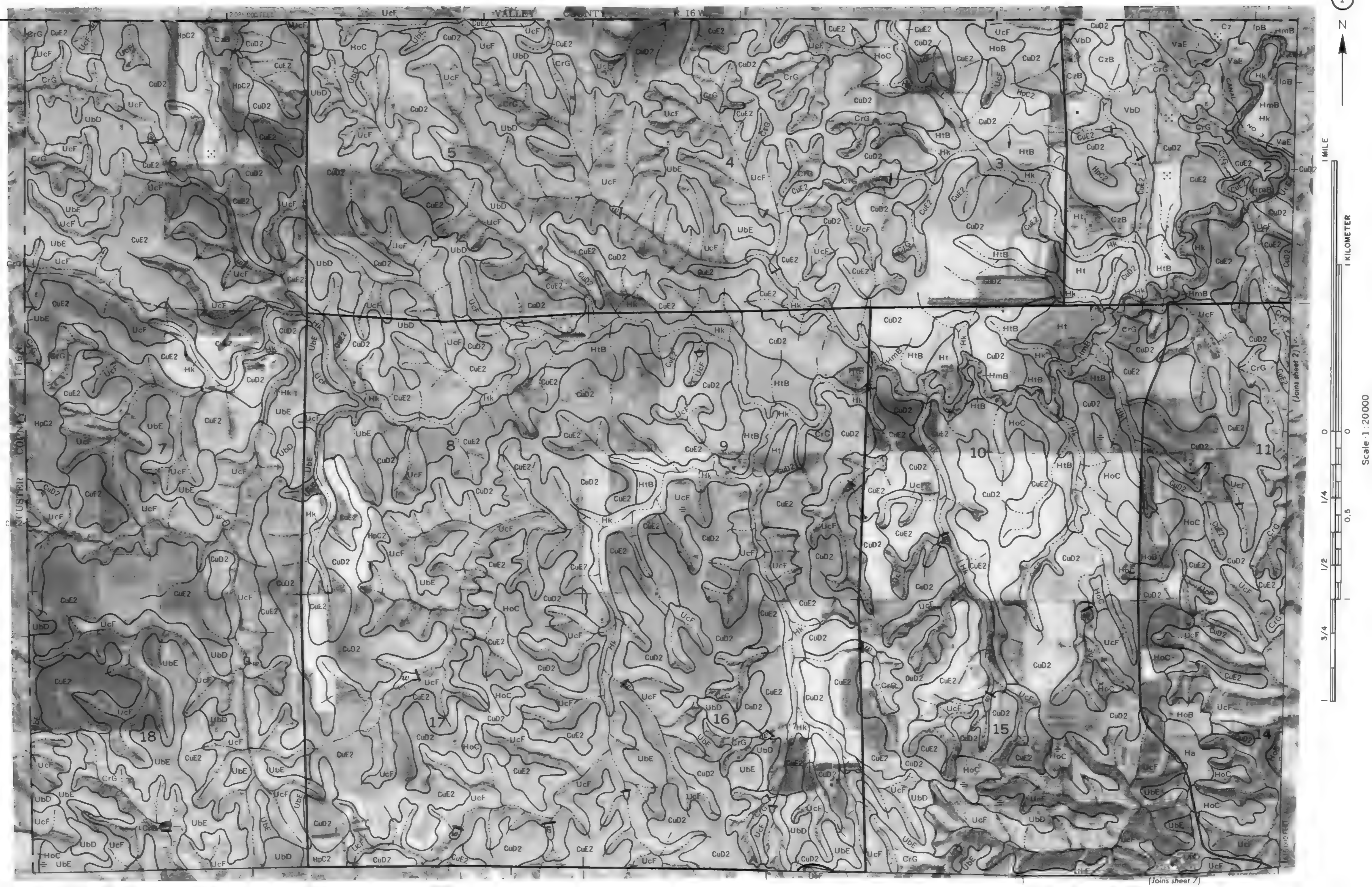
SHORT STEEP SLOPE

GULLY

DEPRESSION (up to 5 acres)

MISCELLANEOUS

- Blowout (up to 5 acres)
- Rock outcrop (up to 3 acres) (includes sandstone and shale)
- Saline spot (up to 3 acres)
- Sandy spot (up to 3 acres)
- Severely eroded spot (up to 5 acres)
- Cut areas (extensive) (up to 3 acres)



SHERMAN COUNTY, NEBRASKA NO. 1

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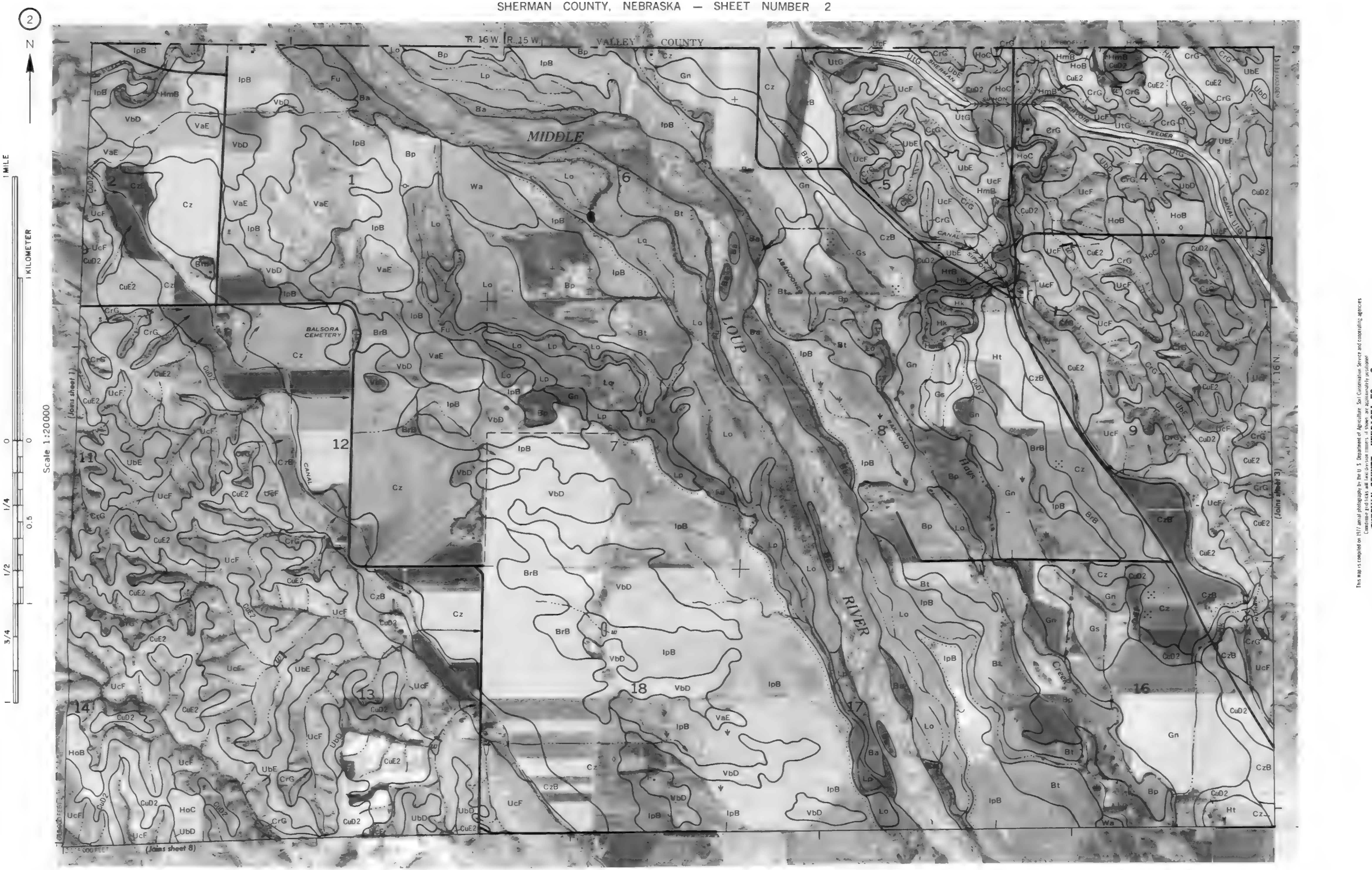
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


2
N
1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0.5
R. 16 W. R. 15 W.
VALLEY COUNTY
MIDDLE
LOUP
RIVER
BALSORA CEMETERY
ABANDONED
RAILROAD
CANAL
SHERMAN
RESERVOIR
FEEDER
Creek
(Joins sheet 1)
(Joins sheet 3)
(Joins sheet 8)
T. 16 N.
SHERMAN COUNTY, NEBRASKA NO. 2

SHERMAN COUNTY, NEBRASKA NO. 3

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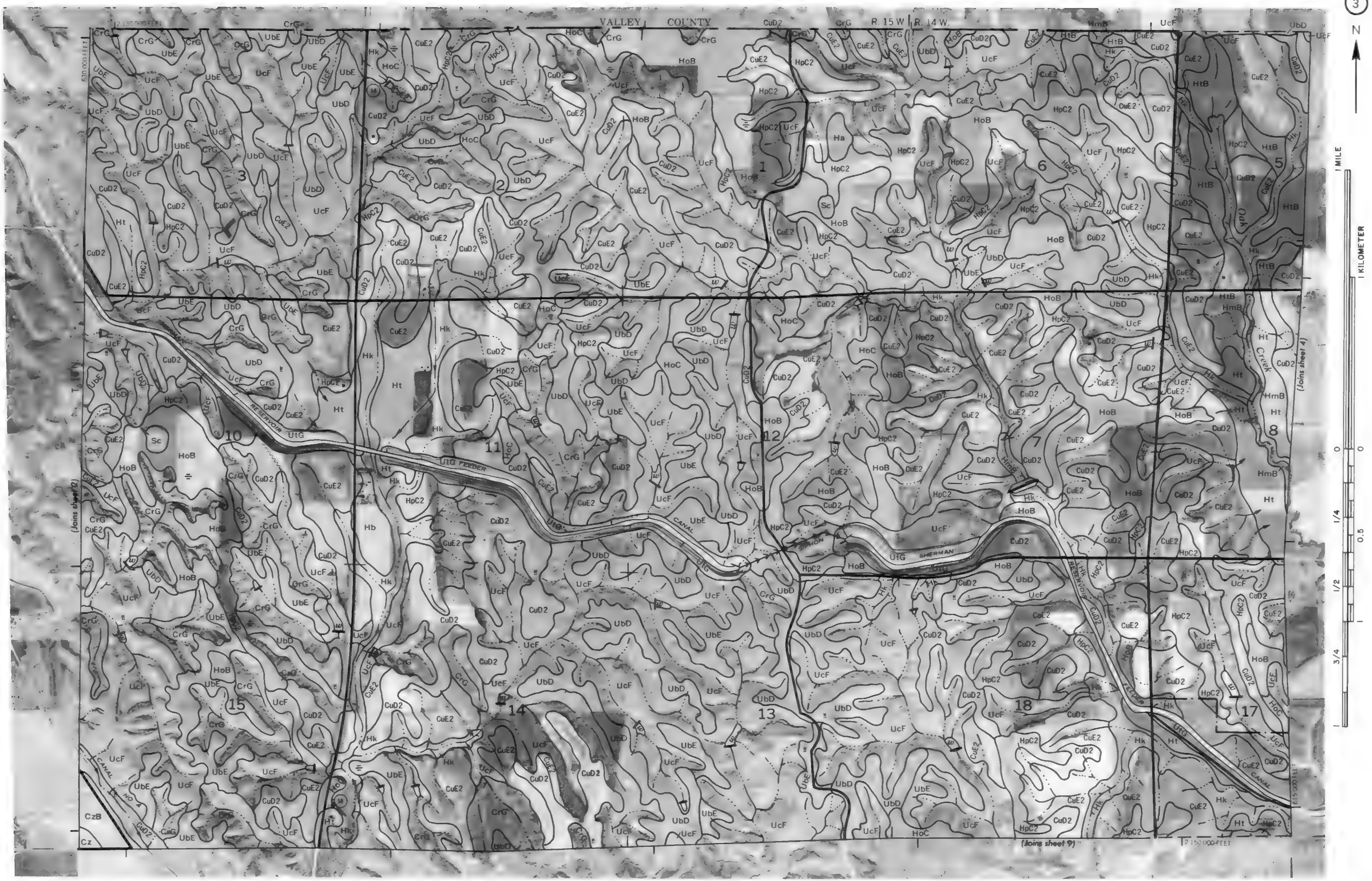

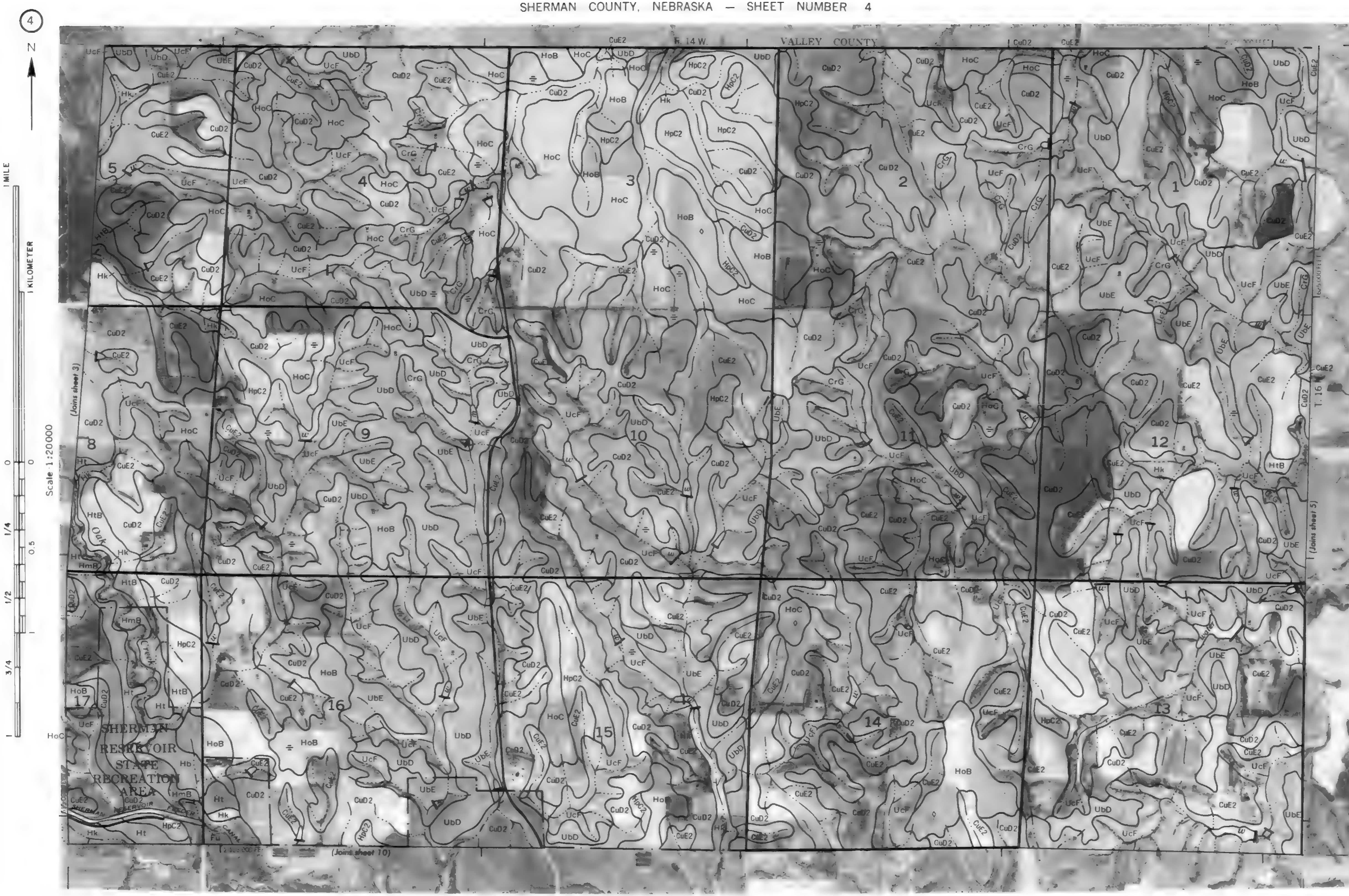

SHERMAN COUNTY, NEBRASKA NO. 4

SHERMAN COUNTY, NEBRASKA NO. 5
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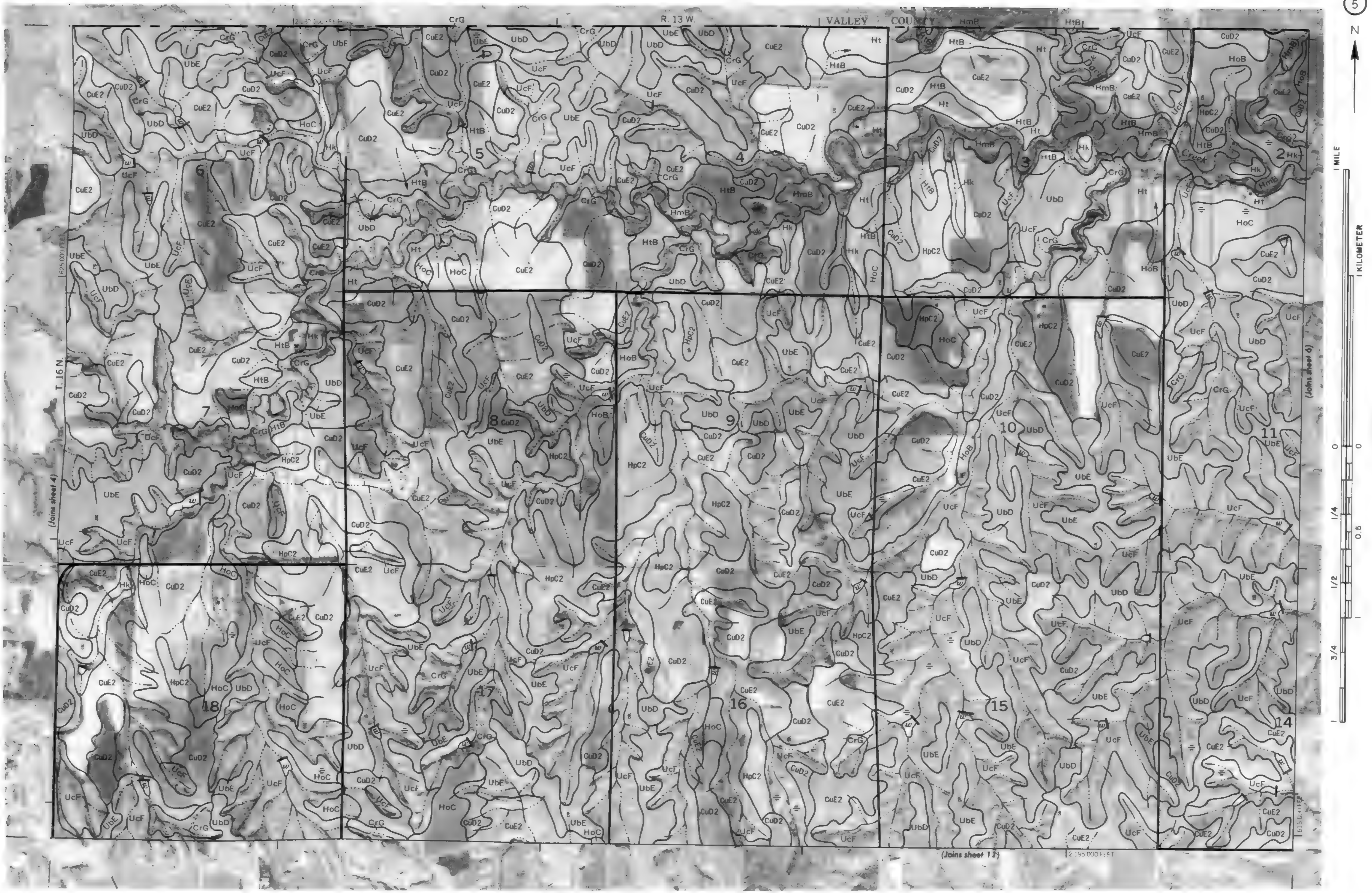
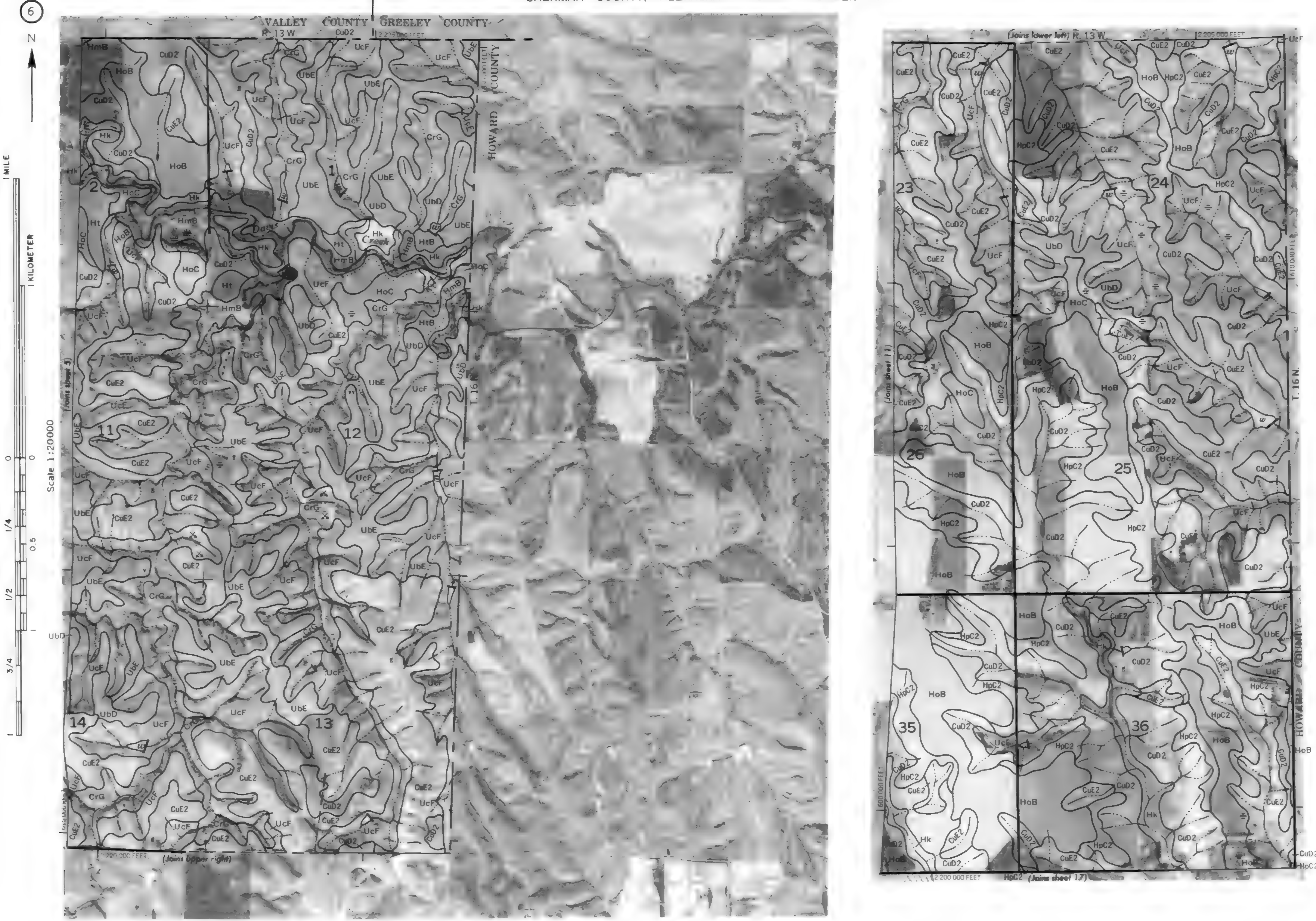
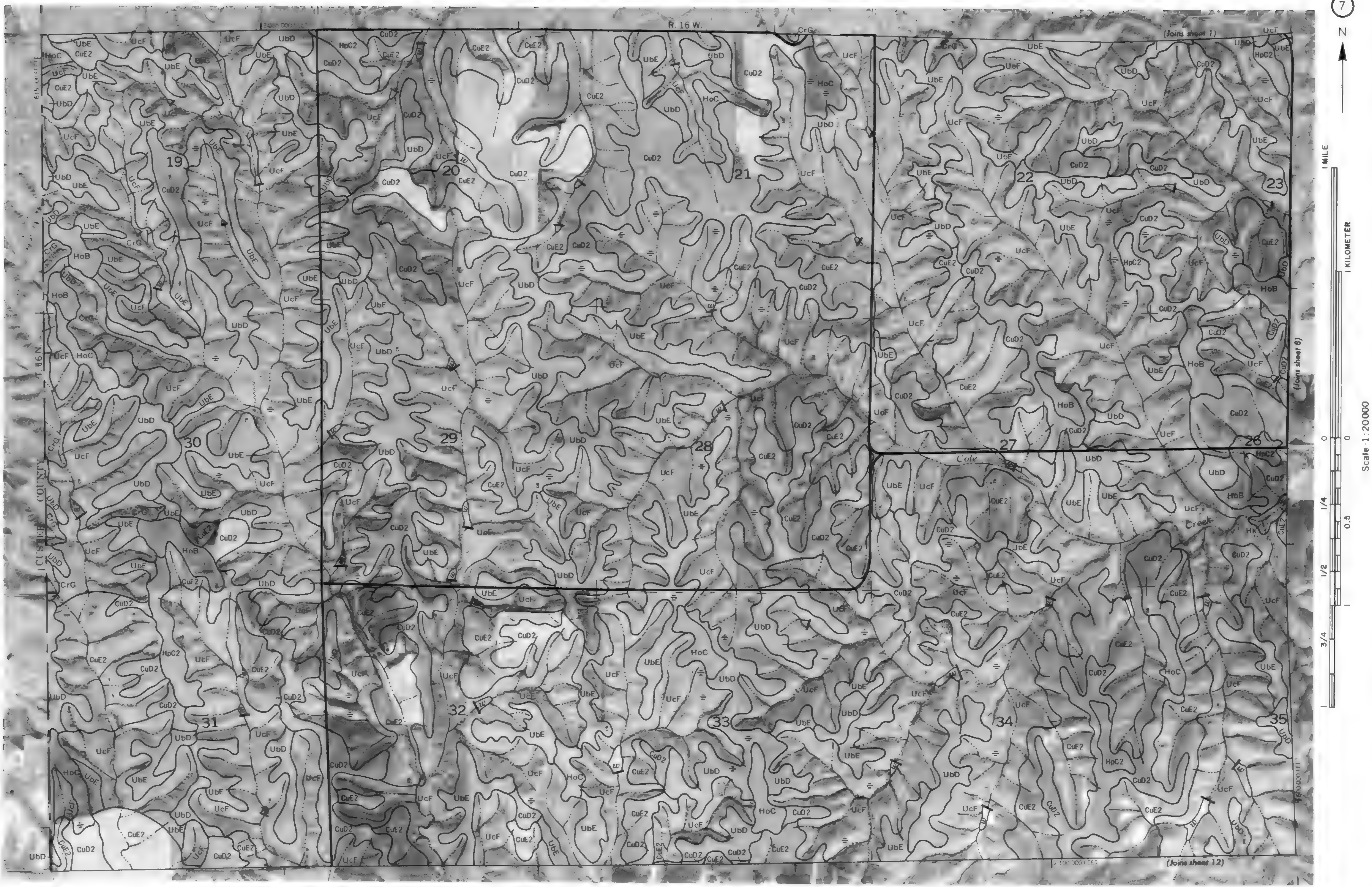




SHERMAN COUNTY, NEBRASKA NO. 6



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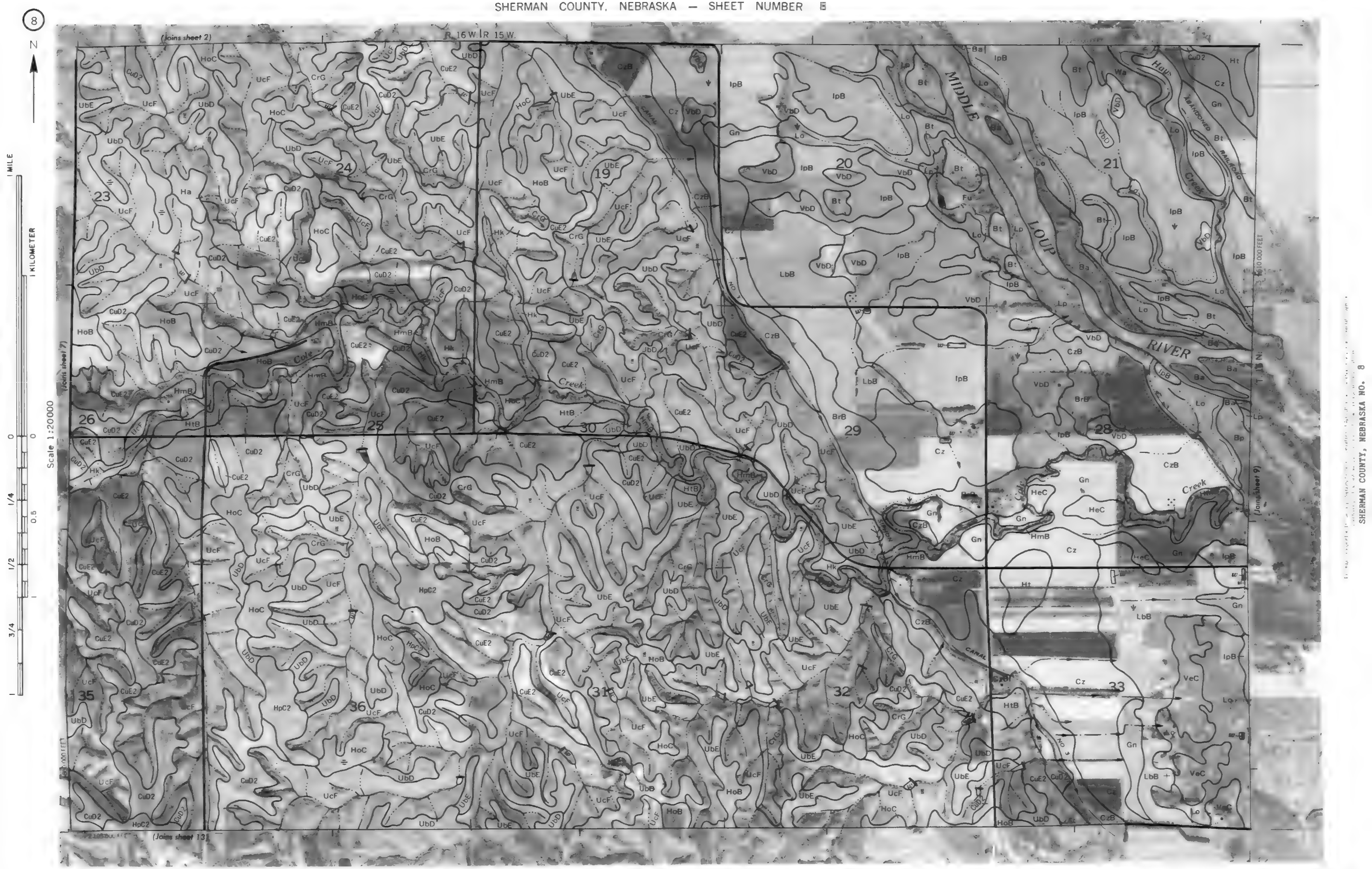
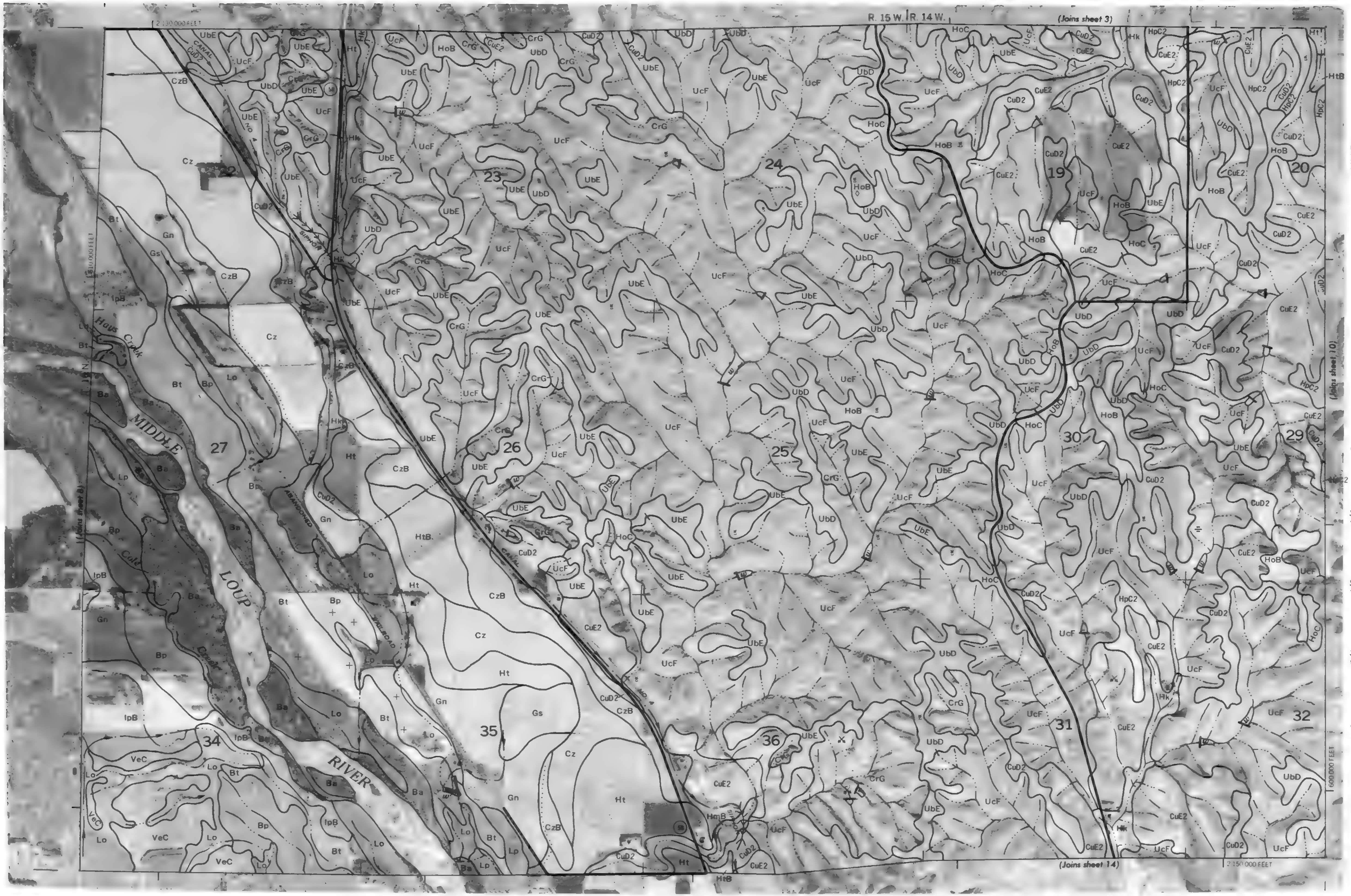

8
N
(Joins sheet 2)
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 13)
R 16 W | R 15 W
Scale 1:20000
1 MILE
1 KILOMETER
MIDDLE
LOUP
RIVER
Cole Creek
Hay Creek
CANAL
ABANDONED RAILROAD
SHERMAN COUNTY, NEBRASKA NO. 8



SHERMAN COUNTY, NEBRASKA NO. 9

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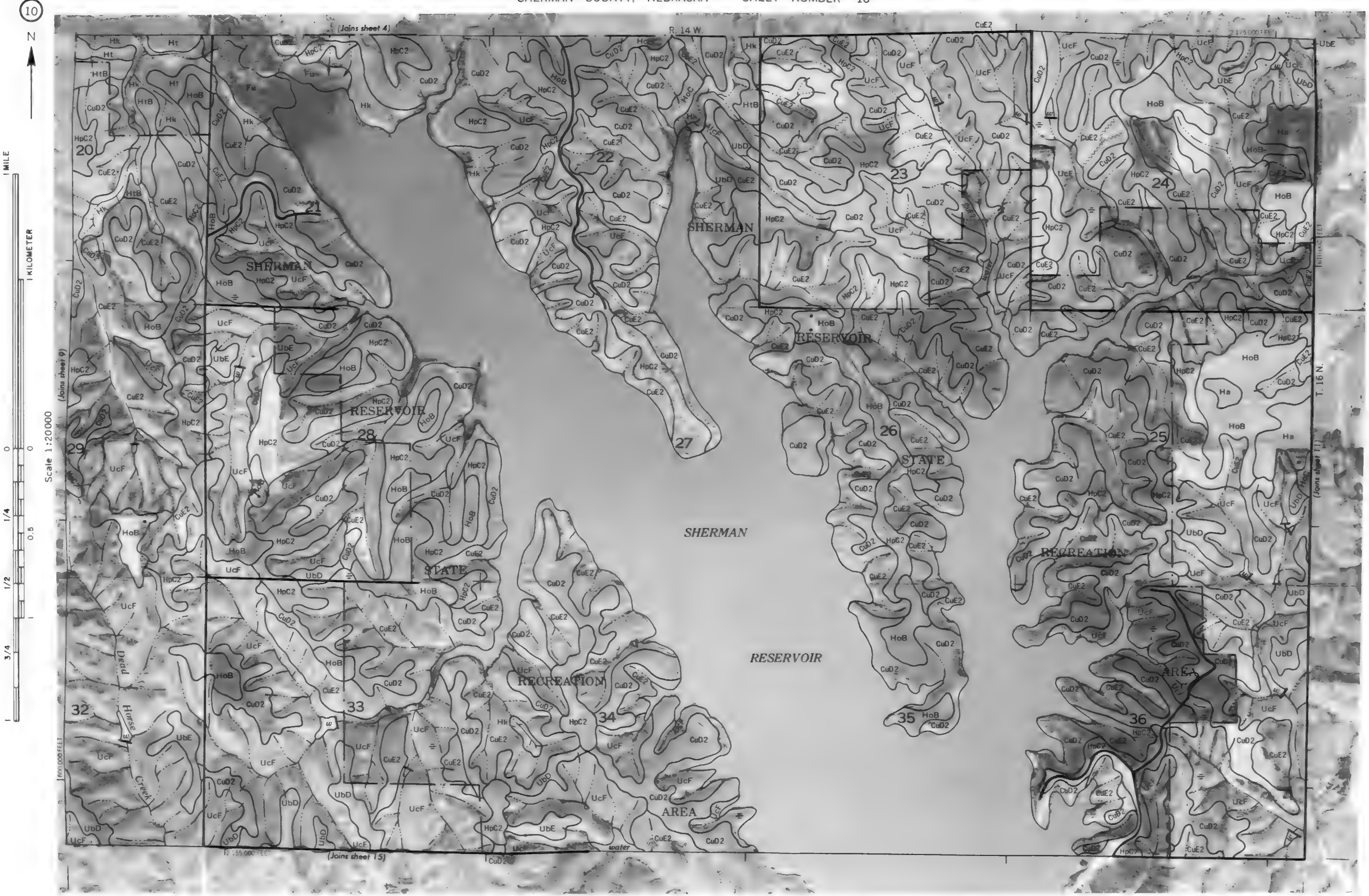

SHERMAN COUNTY, NEBRASKA NO. 10

SHERMAN COUNTY, NEBRASKA NO. 11
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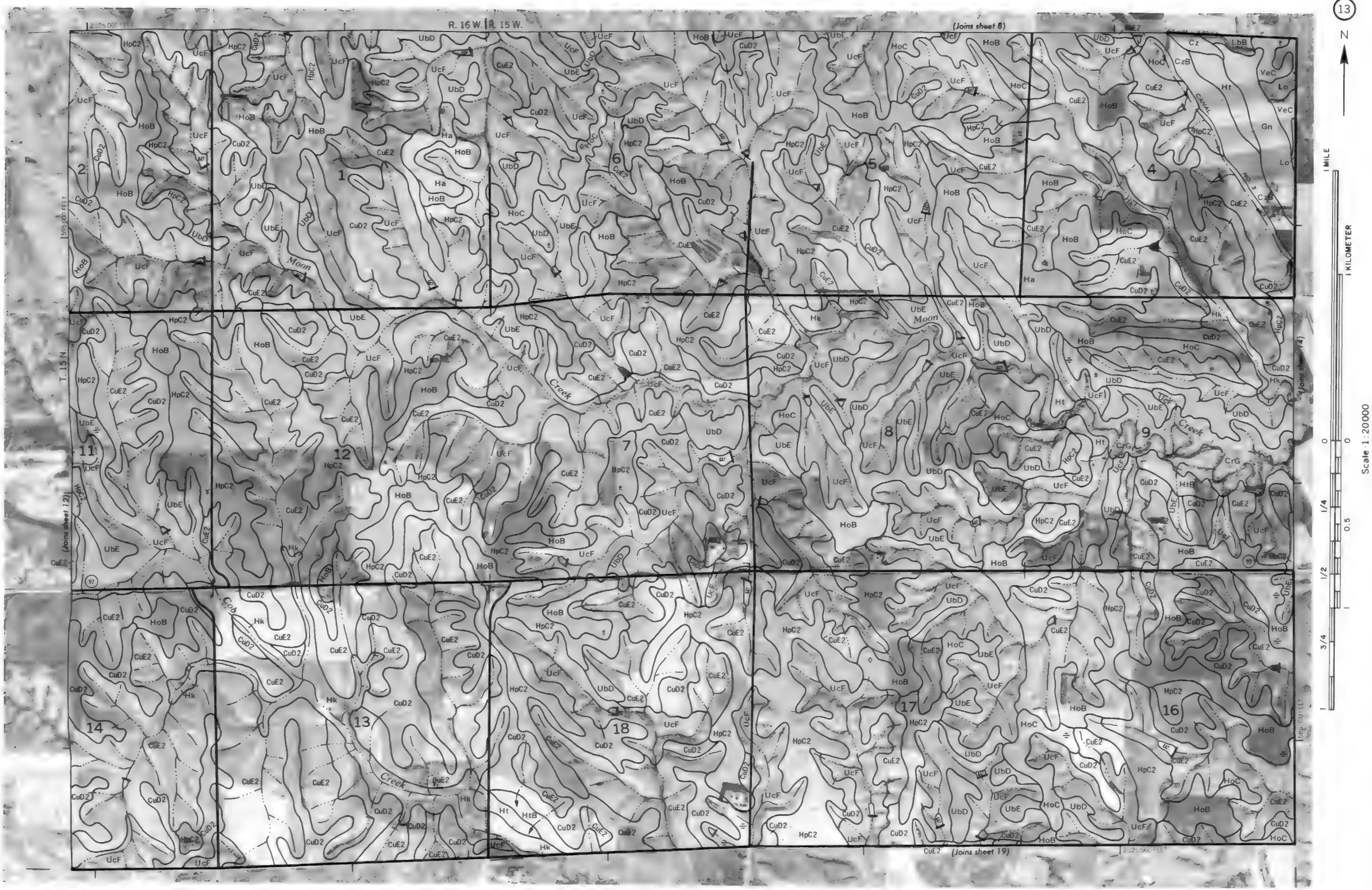
Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
1
(Joins sheet 7)
R. 16 W.
T. 15 N.
(Joins sheet 13)
(Joins sheet 18)
LONE ELM CEMETERY
CUSTER COUNTY
Clear
Creek
Cob
Creek
2
3
4
5
6
7
8
9
10
11
14
15
16
17
18



SHERMAN COUNTY, NEBRASKA NO. 13
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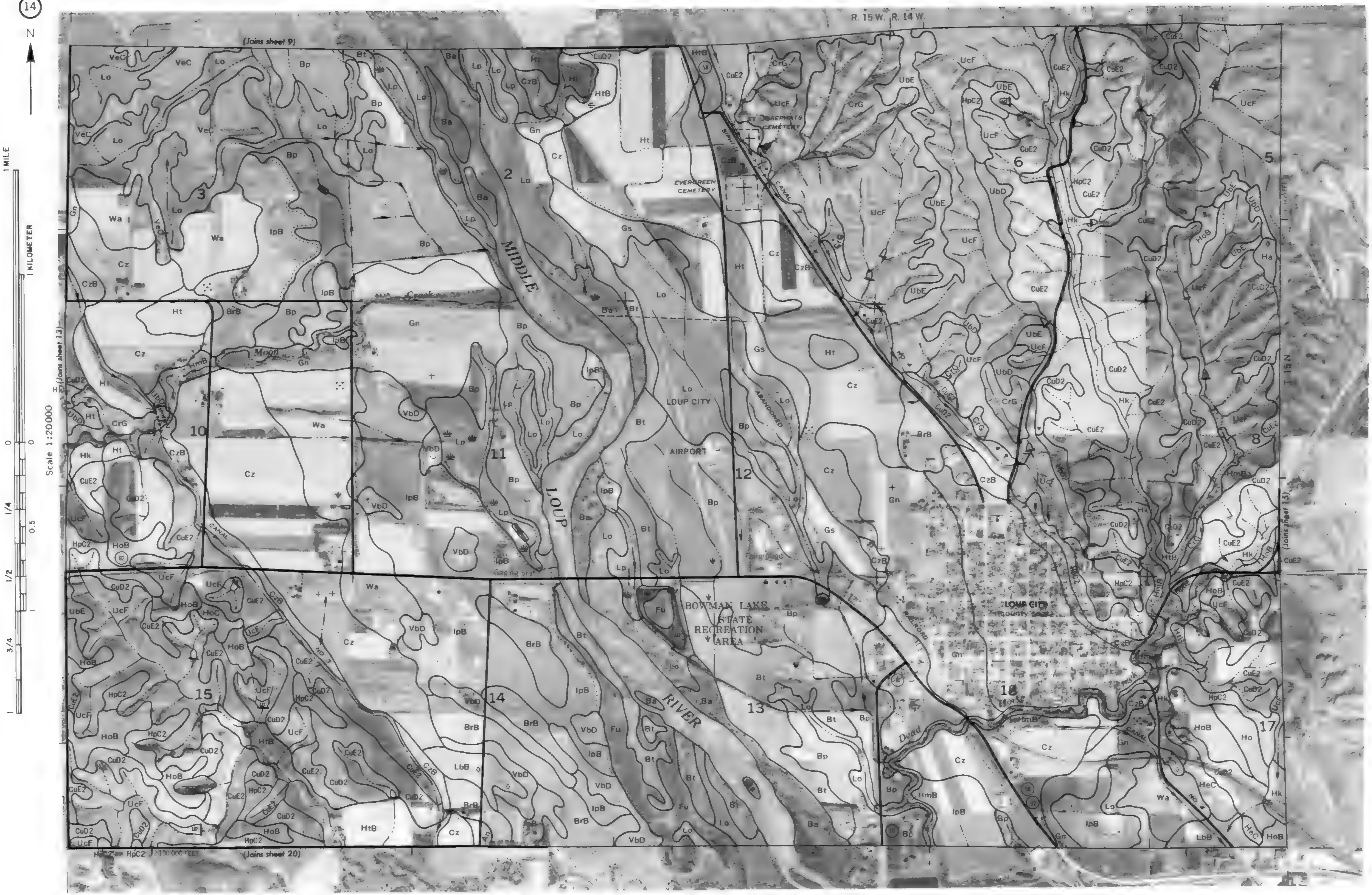
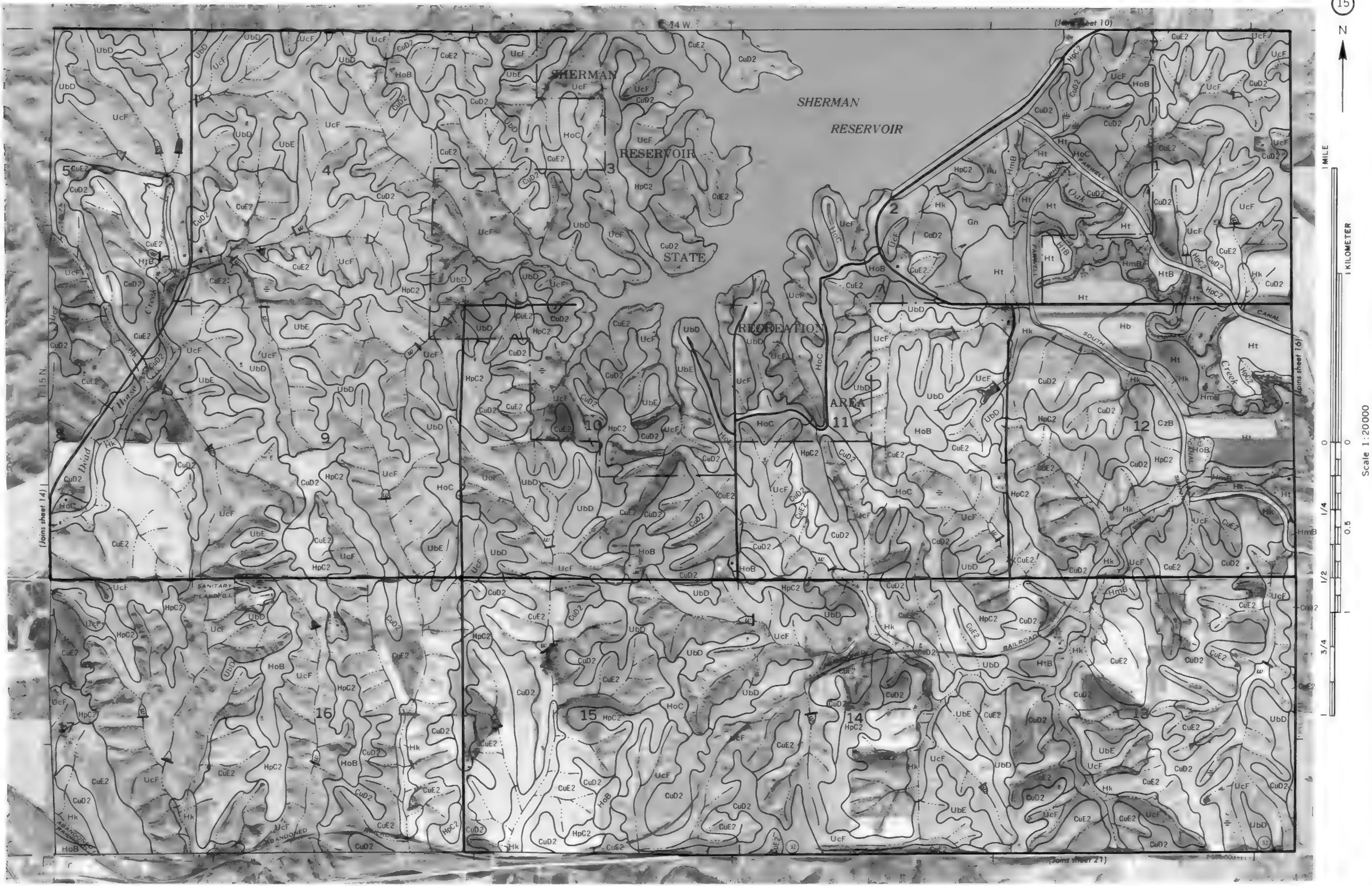
Coordinate grid ticks and land division corners, if shown, are approximately positioned


14
N
R. 15 W. R. 14 W.
(Joins sheet 9)
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 20)
MIDDLE LOUP RIVER
LOUP CITY
AIRPORT
BOWMAN LAKE STATE RECREATION AREA
LOUP CITY County Seat
EVERGREEN CEMETERY
ST. JOSEPHATS CEMETERY
CANAL
Moon
Creek
Dead
Fairground
T. 15 N.
1 MILE
1 KILOMETER
Scale 1:20000
SHERMAN COUNTY, NEBRASKA NO. 14



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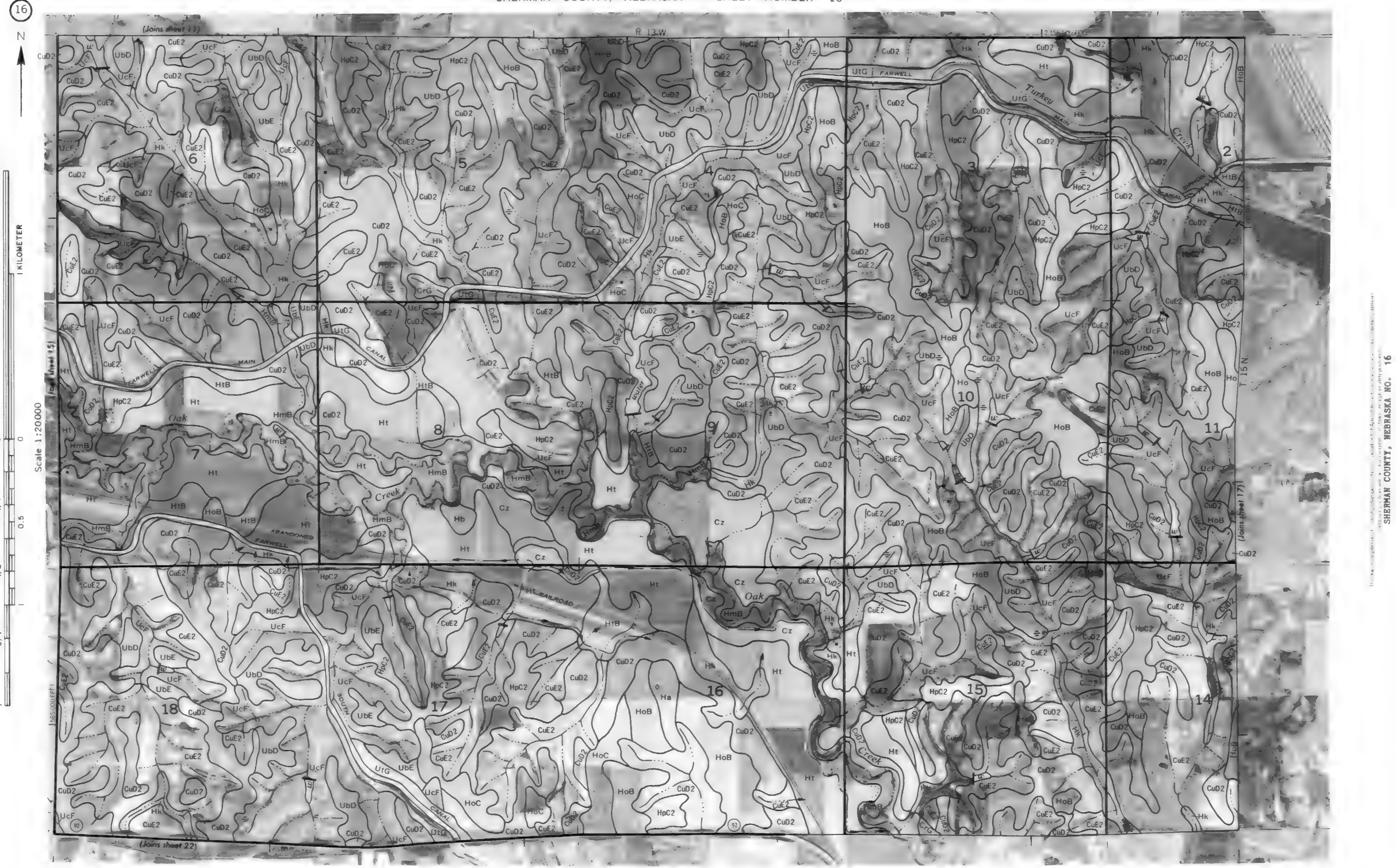
16
N
(Joins sheet 11)
(Joins sheet 22)
(Joins sheet 17)
R. 13 W.
T. 15 N.
Farwell
Main
Canal
Turkey
Creek
Oak
Creek
Railroad
Abandoned
South
Simpson
1 MILE
1 KILOMETER
Scale 1:20000
0
1/4
1/2
3/4
1
0
0.5
SHERMAN COUNTY, NEBRASKA NO. 16

SHERMAN COUNTY, NEBRASKA NO. 17
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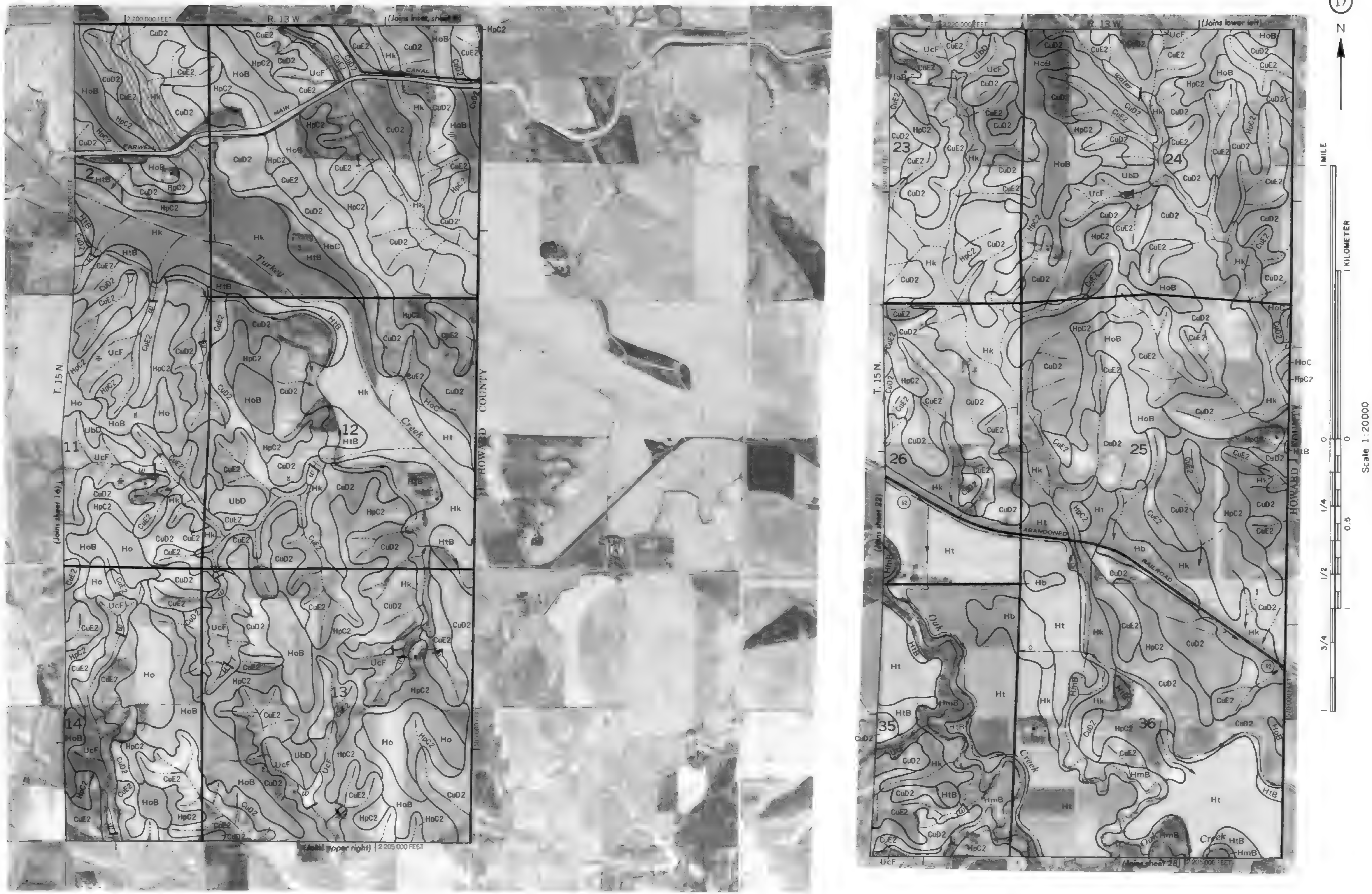

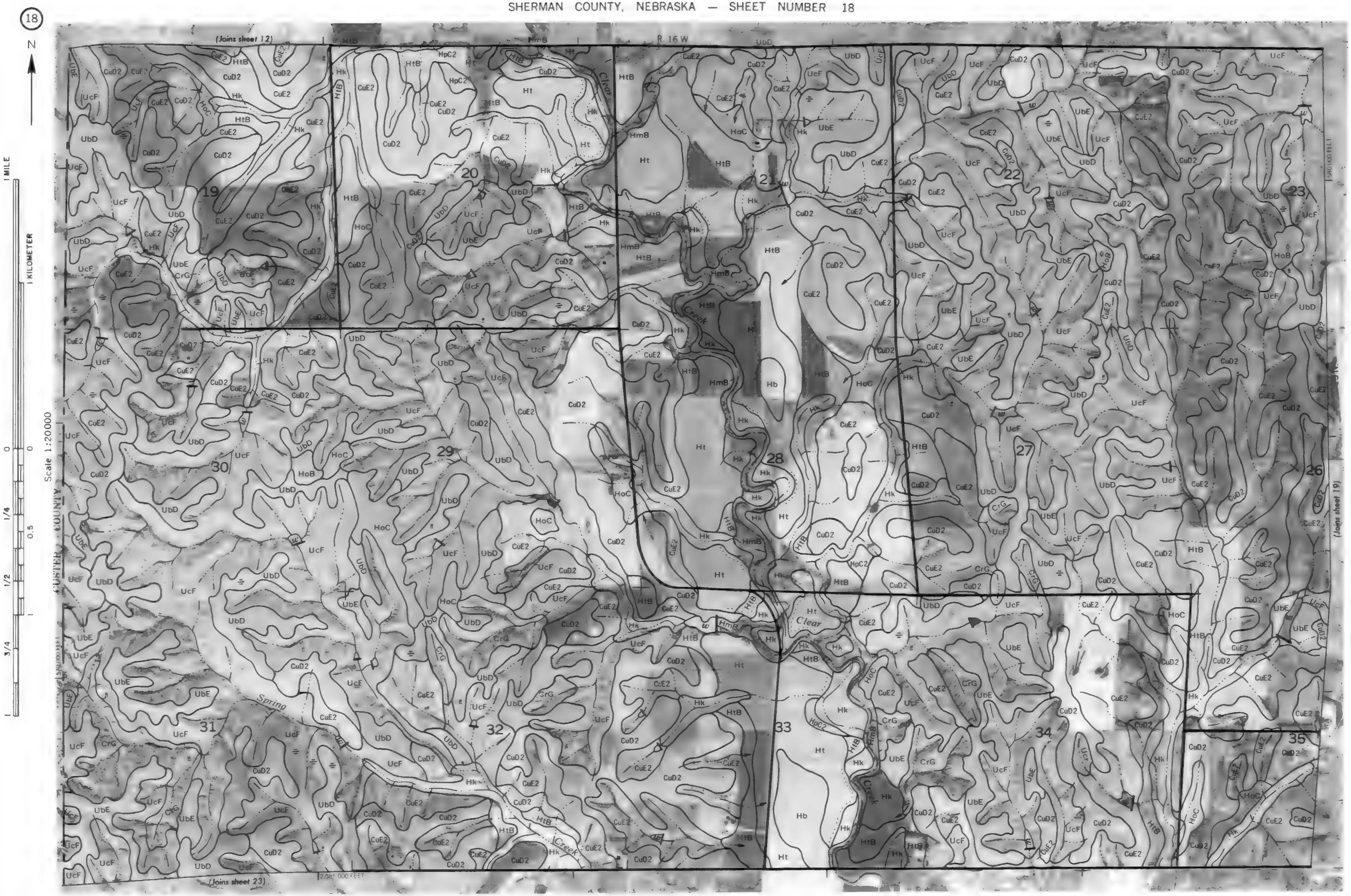

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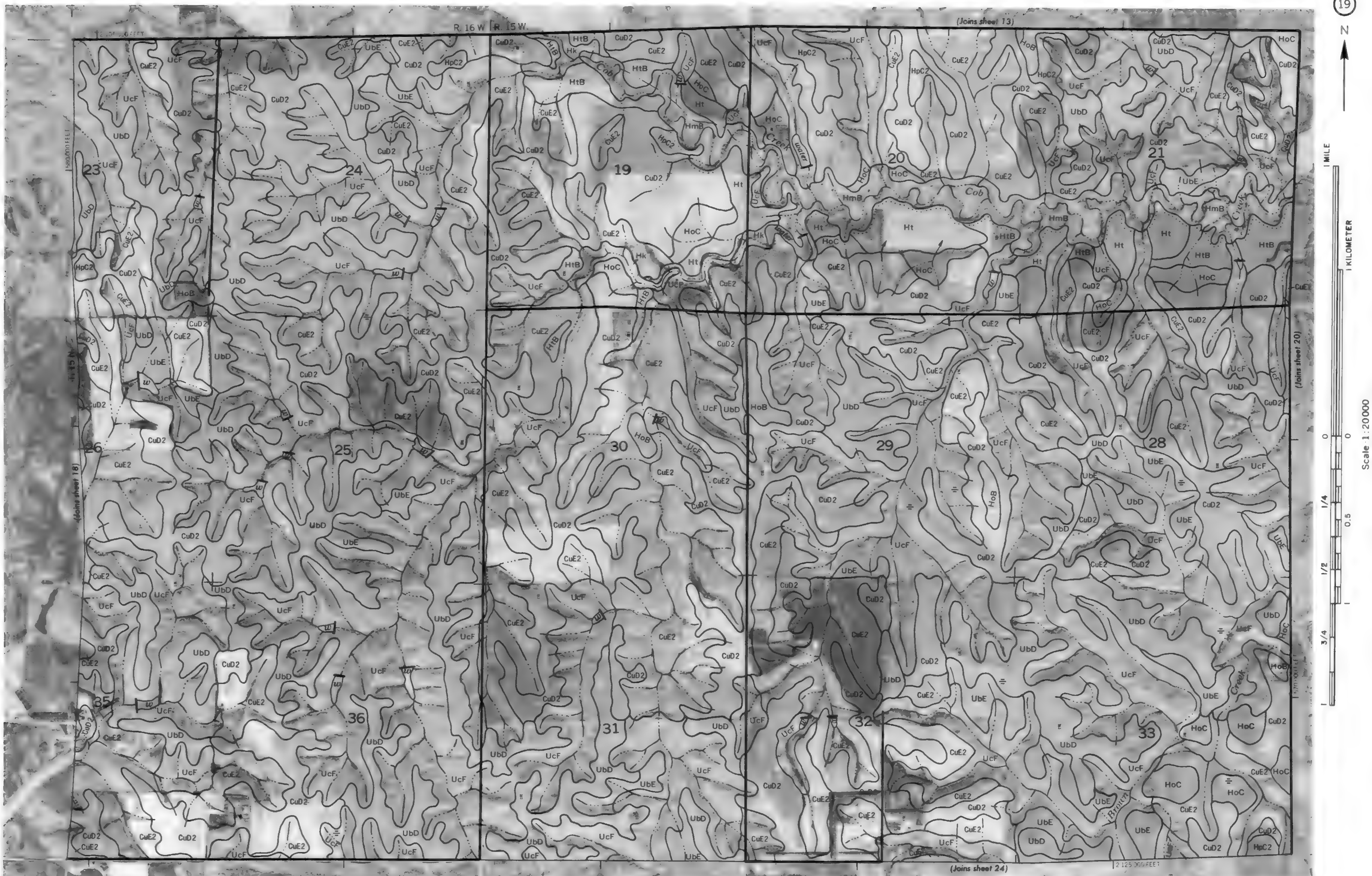

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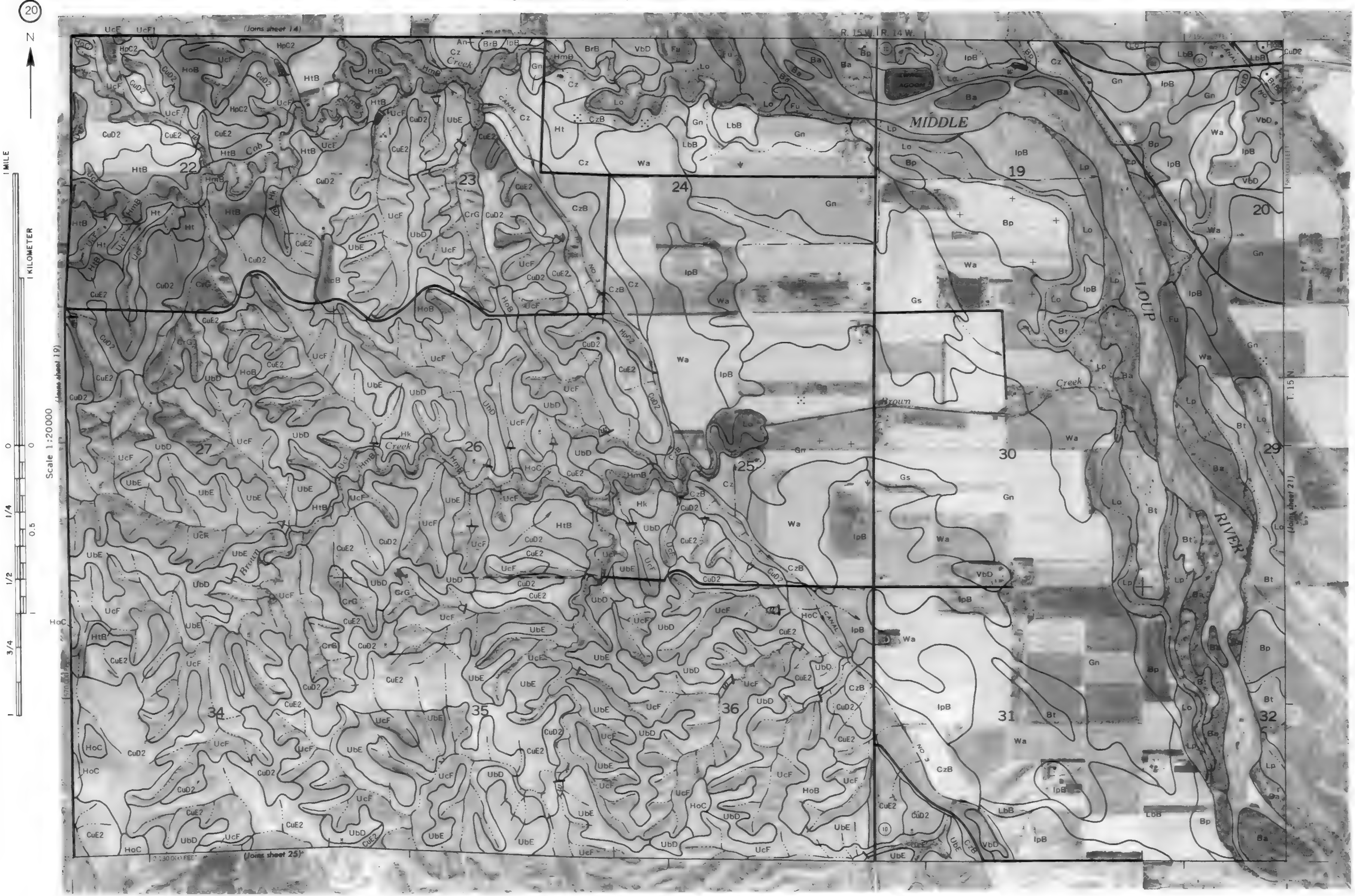

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SHERMAN COUNTY, NEBRASKA NO. 21
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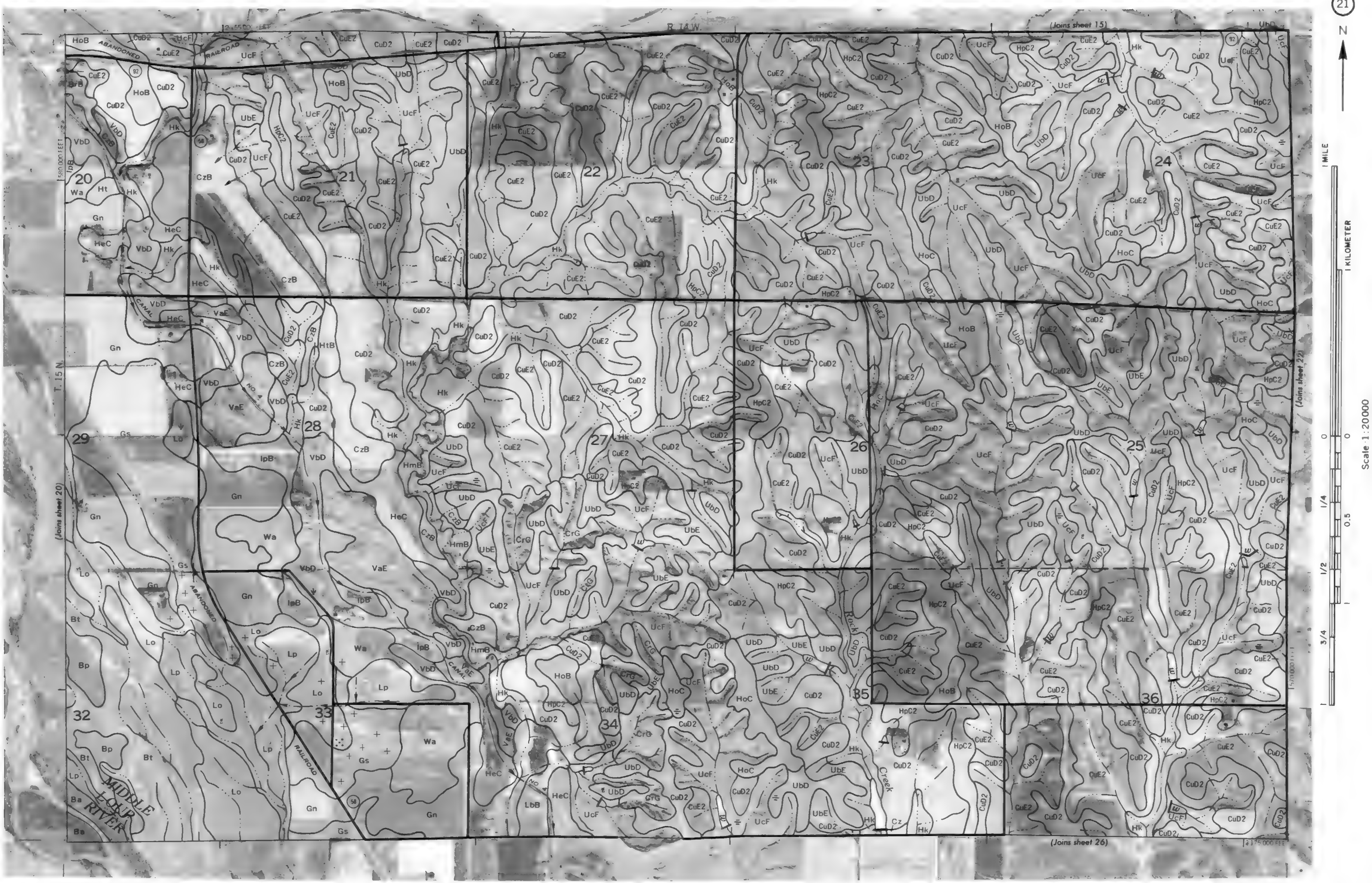


22

N

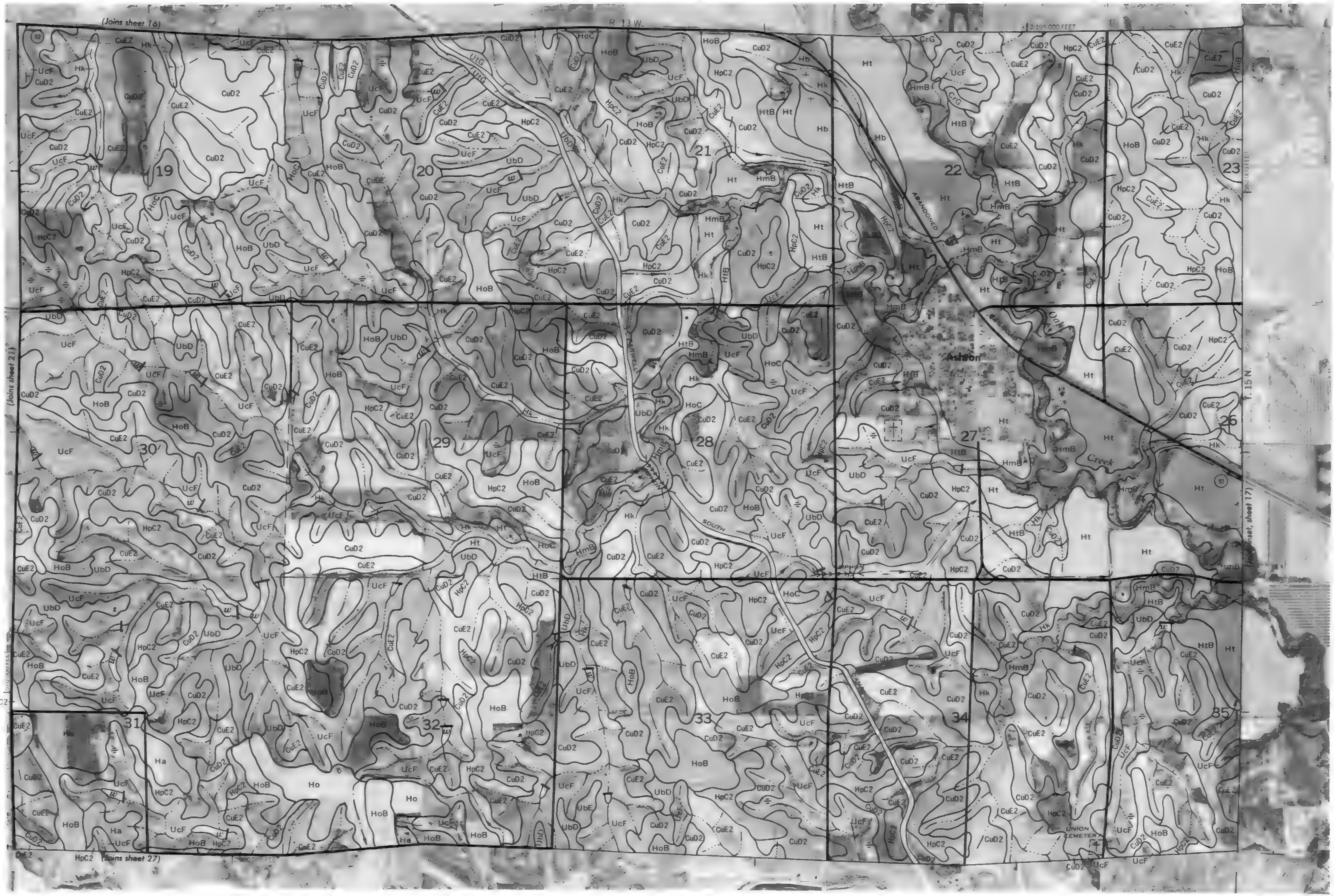
1 MILE

1 KILOMETER

Scale 1:20000

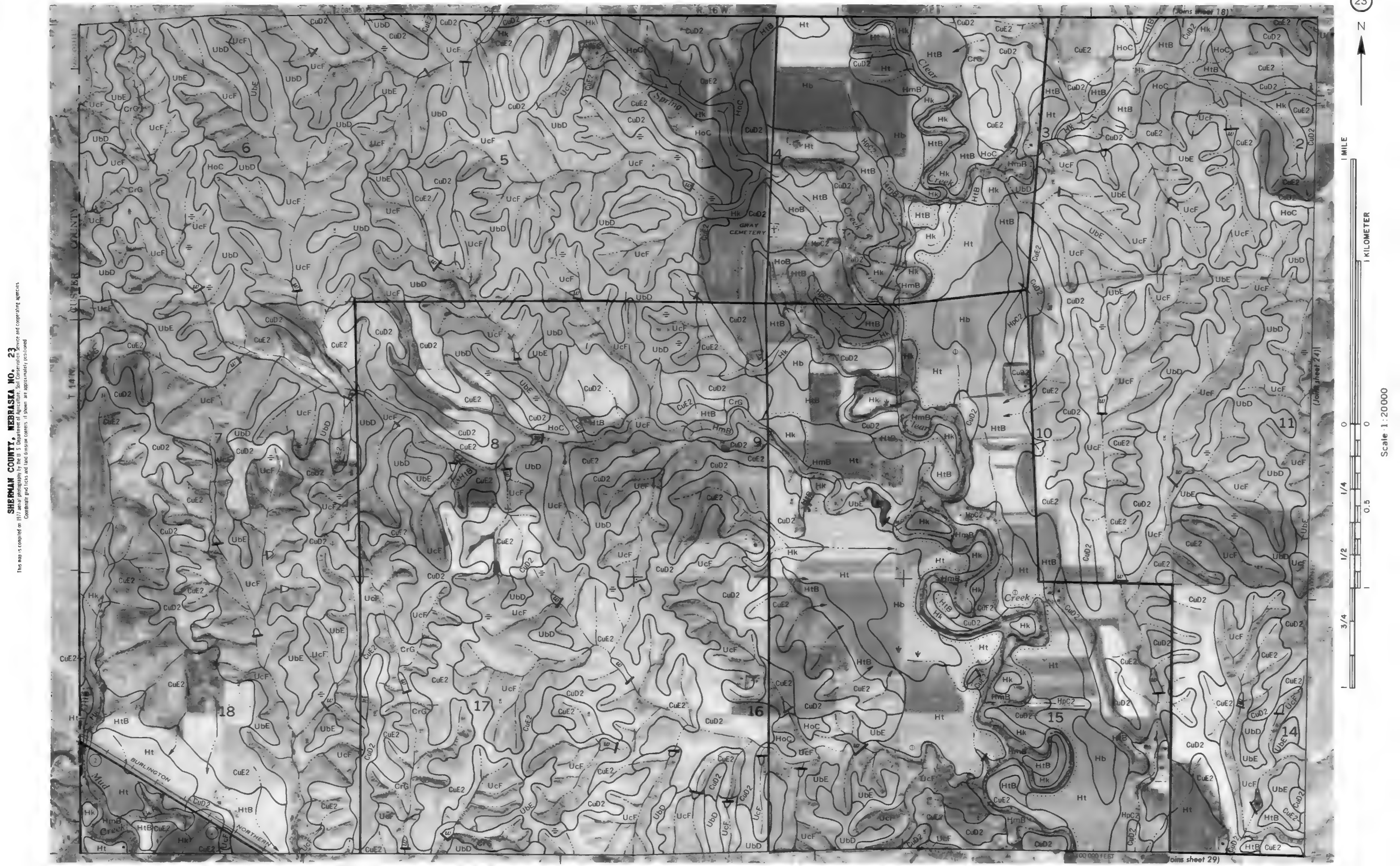
0 1/4 1/2 3/4 1

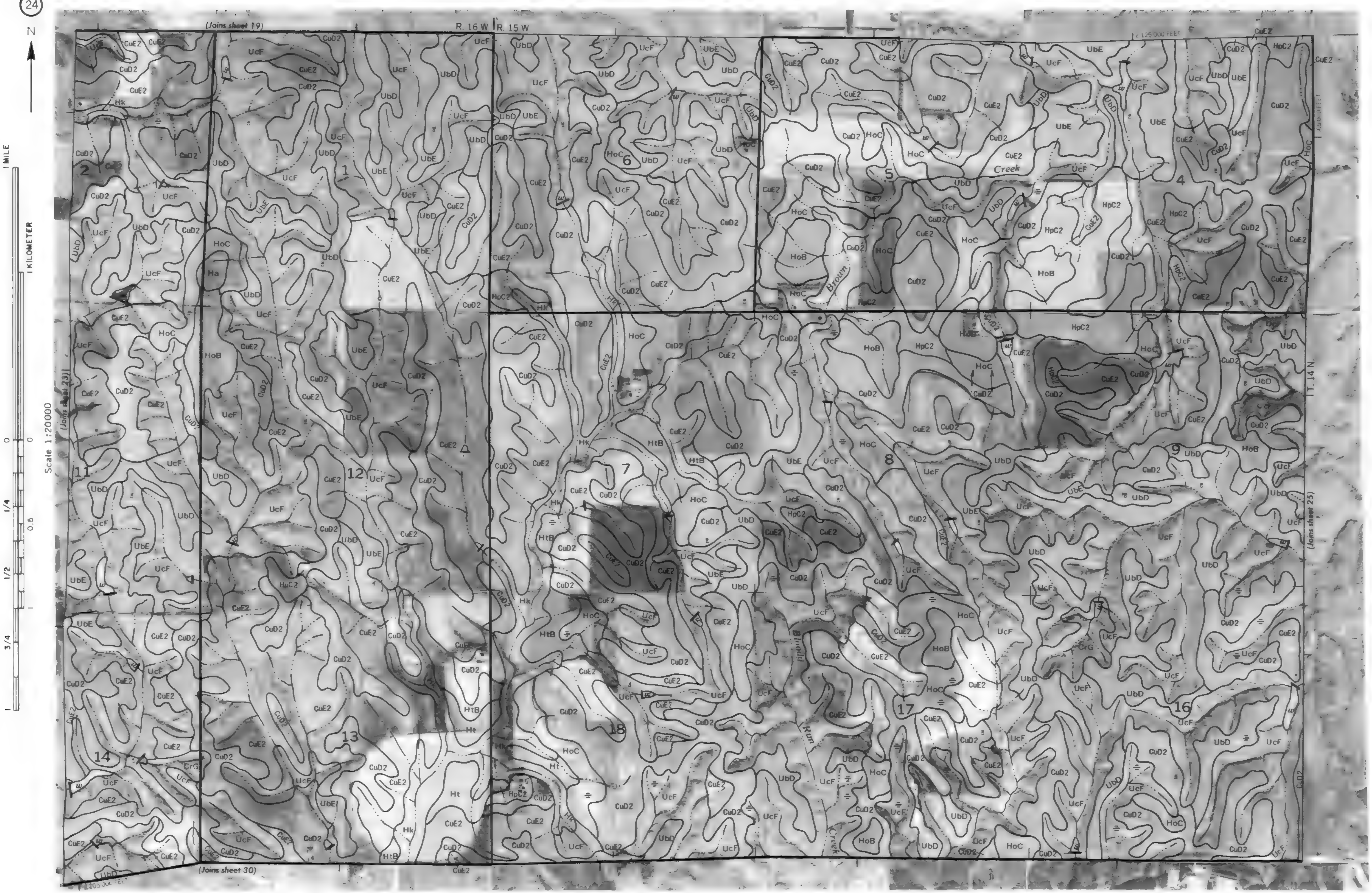
0 0.5 1



This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 22

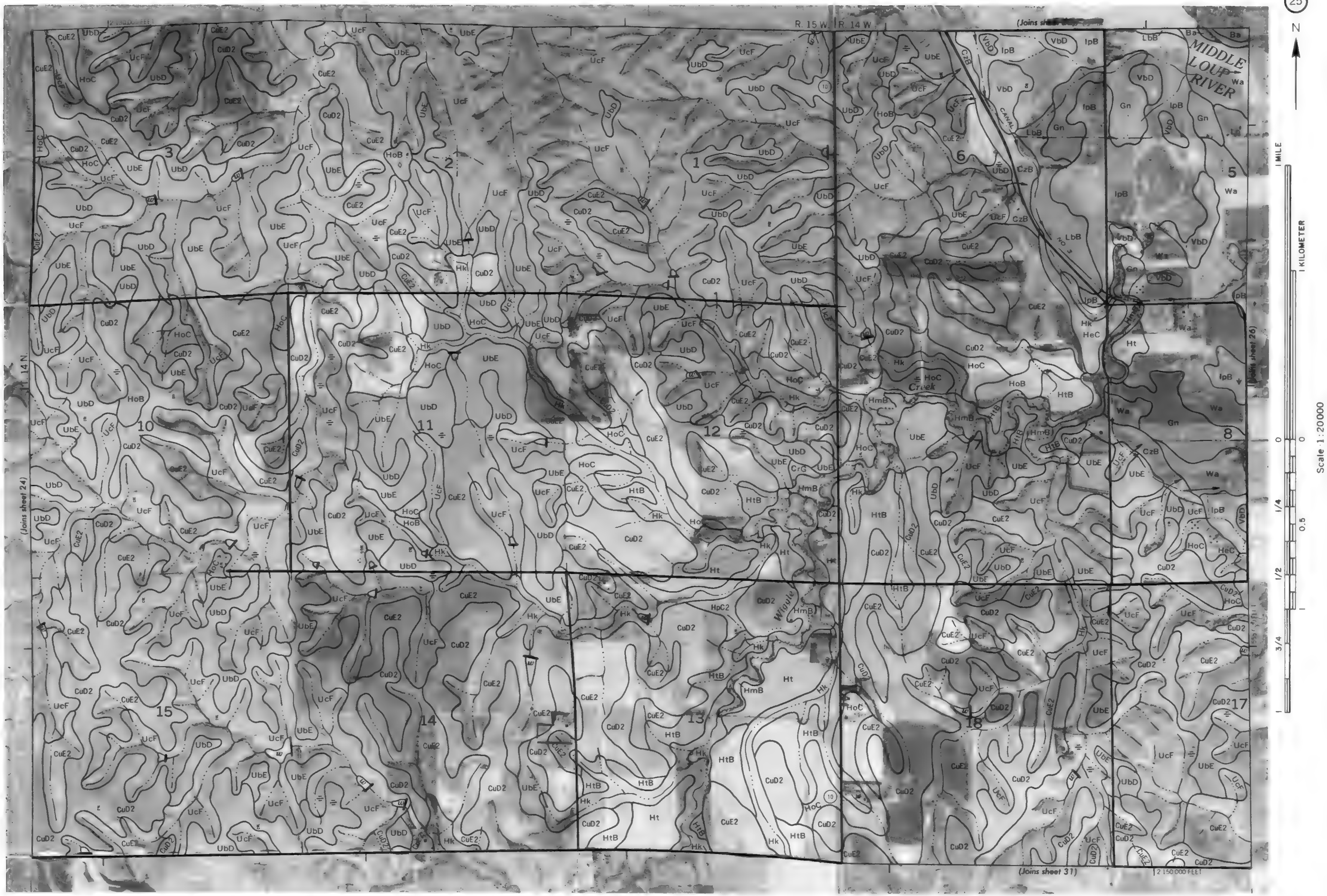

(Joins sheet 18)
(Joins sheet 24)
(Joins sheet 29)
R. 16 W.
T. 14 N.
CUSTER COUNTY
Spring Creek
Clear Creek
GRAY CEMETERY
BURLINGTON NORTHERN
Mud Creek
23
N
1 MILE
1 KILOMETER
Scale 1:20 000
0
1/4
1/2
3/4
0.5
SHERMAN COUNTY, NEBRASKA NO. 23
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned



This map is compiled on 197? aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

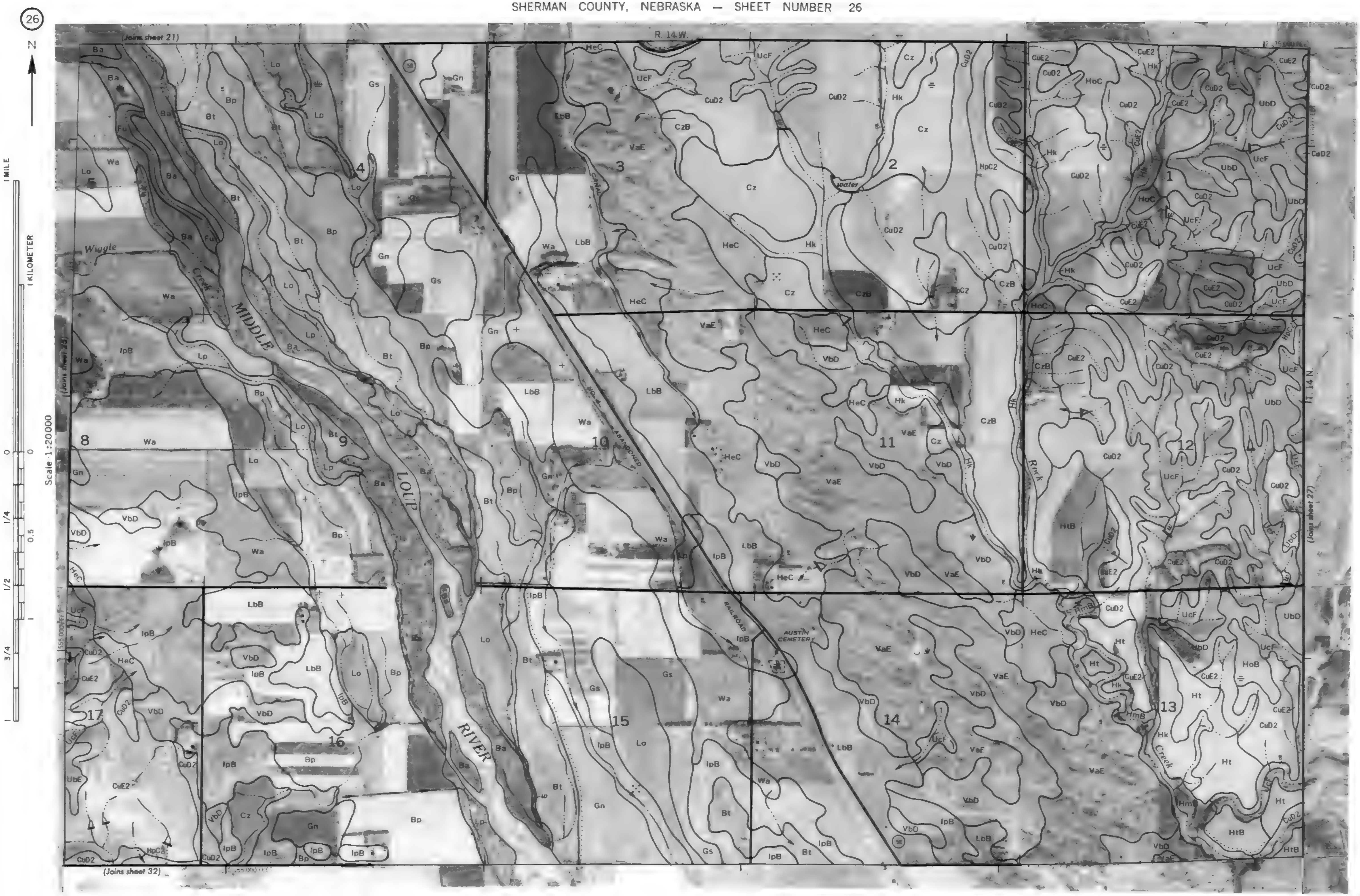
SHERMAN COUNTY, NEBRASKA NO. 24

SHERMAN COUNTY, NEBRASKA — SHEET NUMBER 25



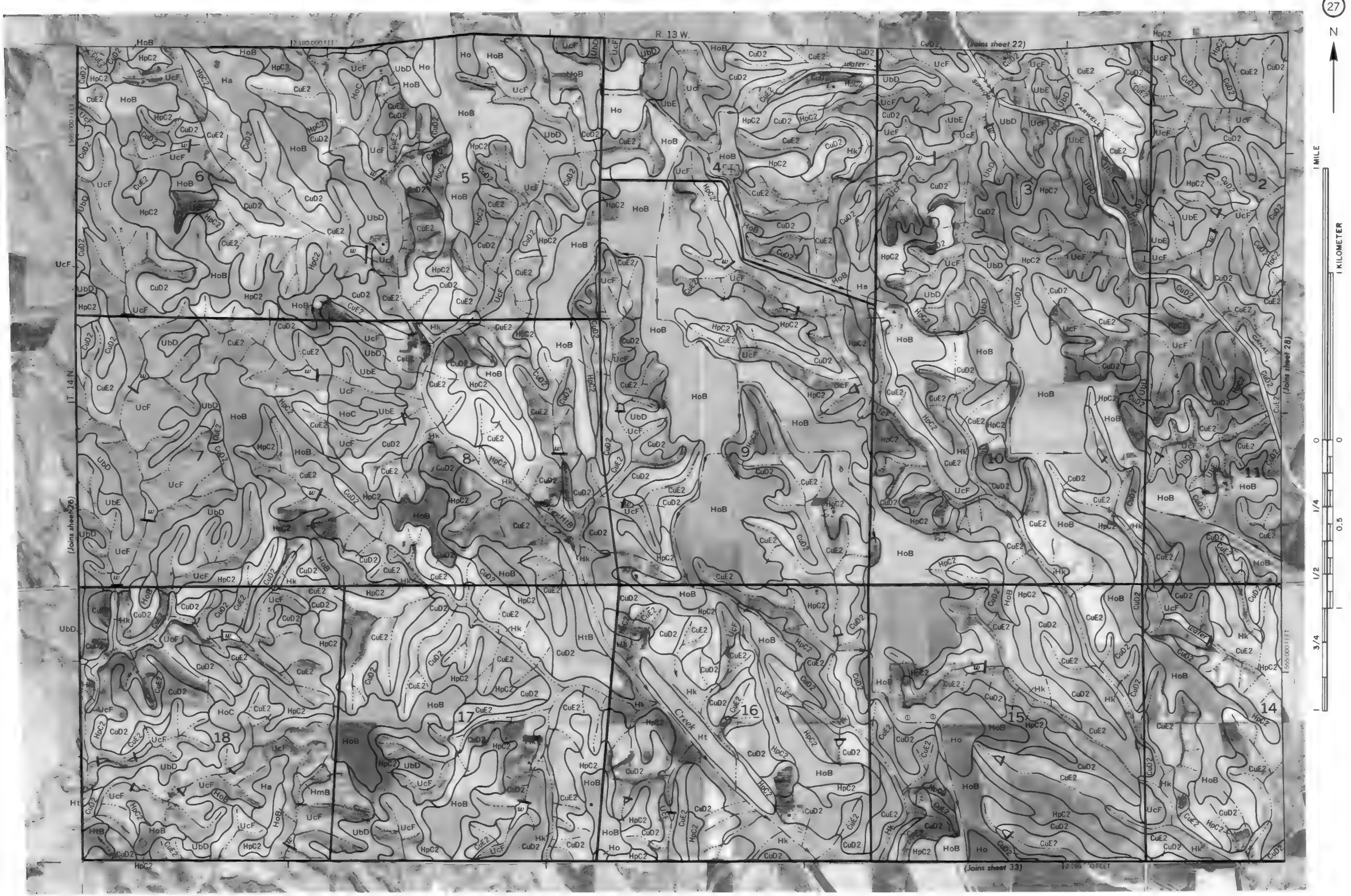
SHERMAN COUNTY, NEBRASKA NO. 25

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



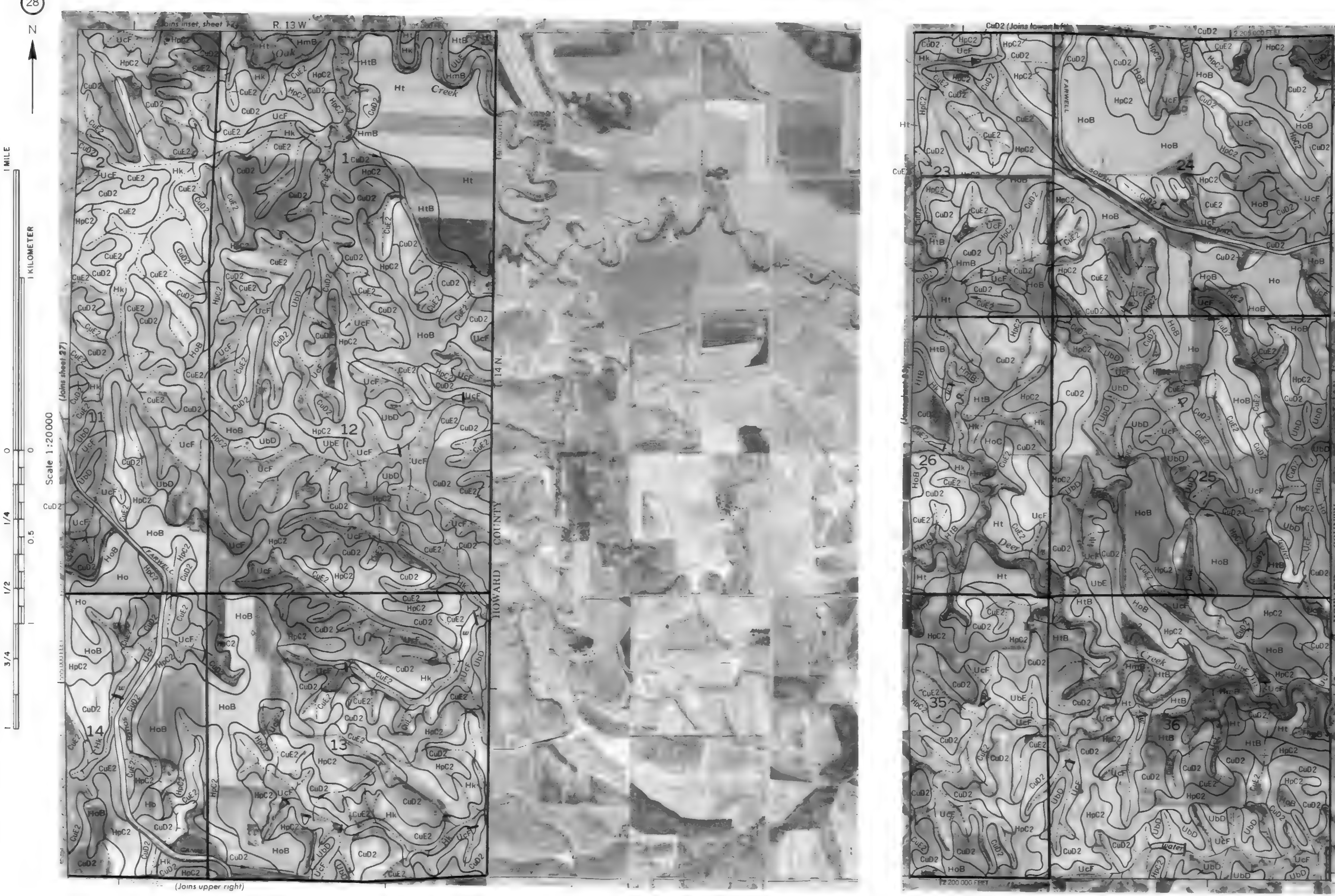
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 26



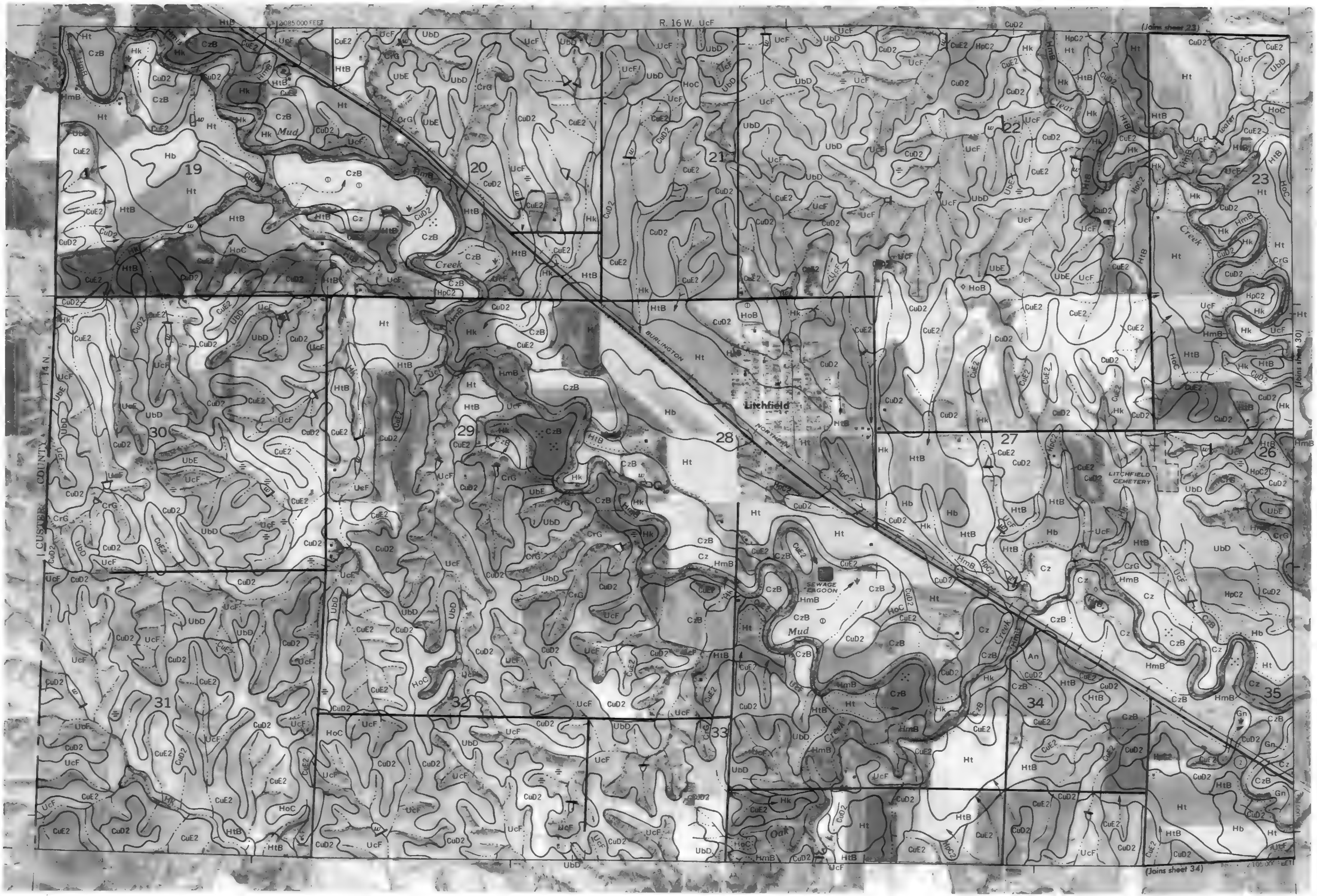
SHERMAN COUNTY, NEBRASKA NO. 27

This map is compiled on 1972 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



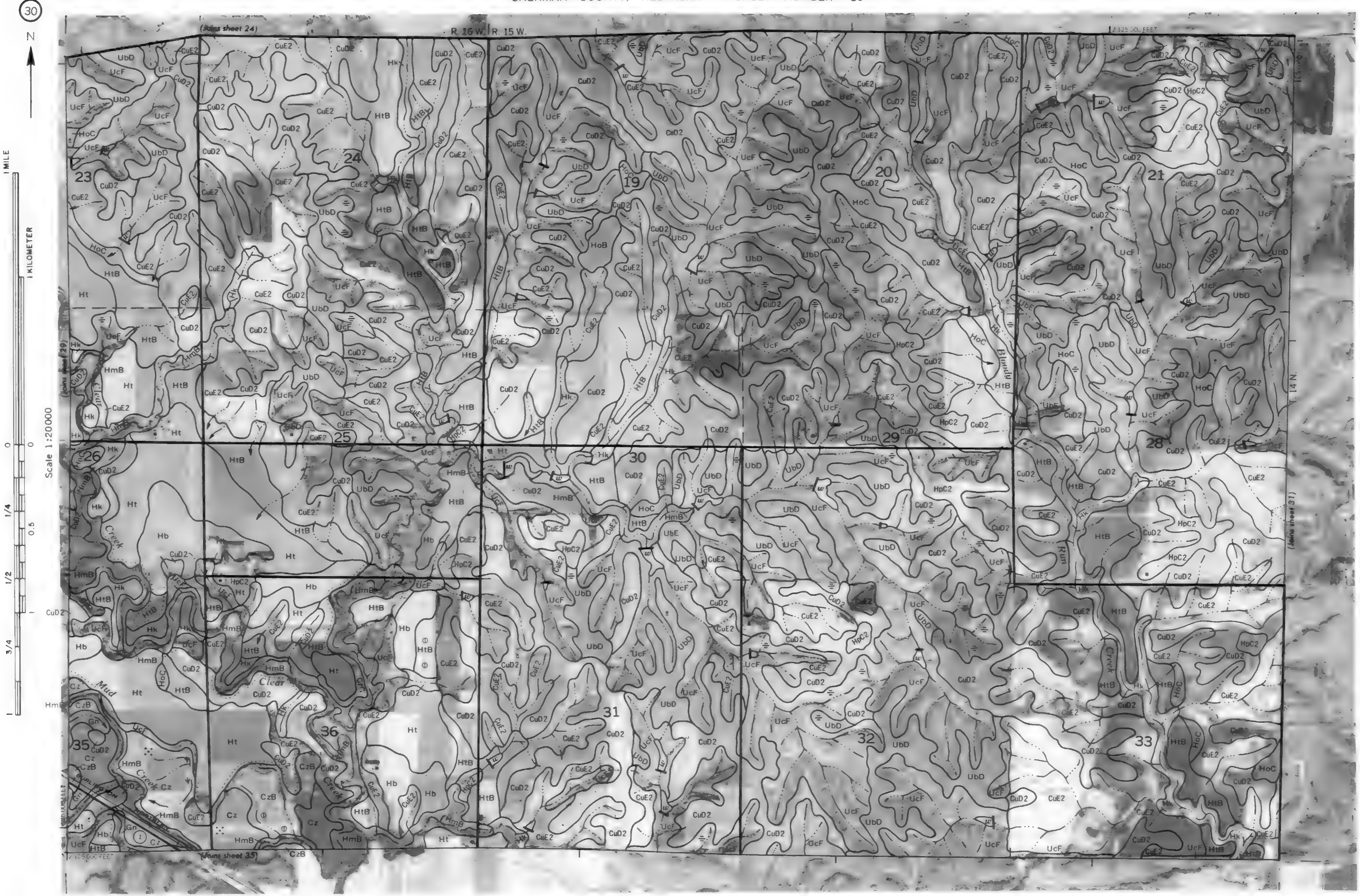
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 28



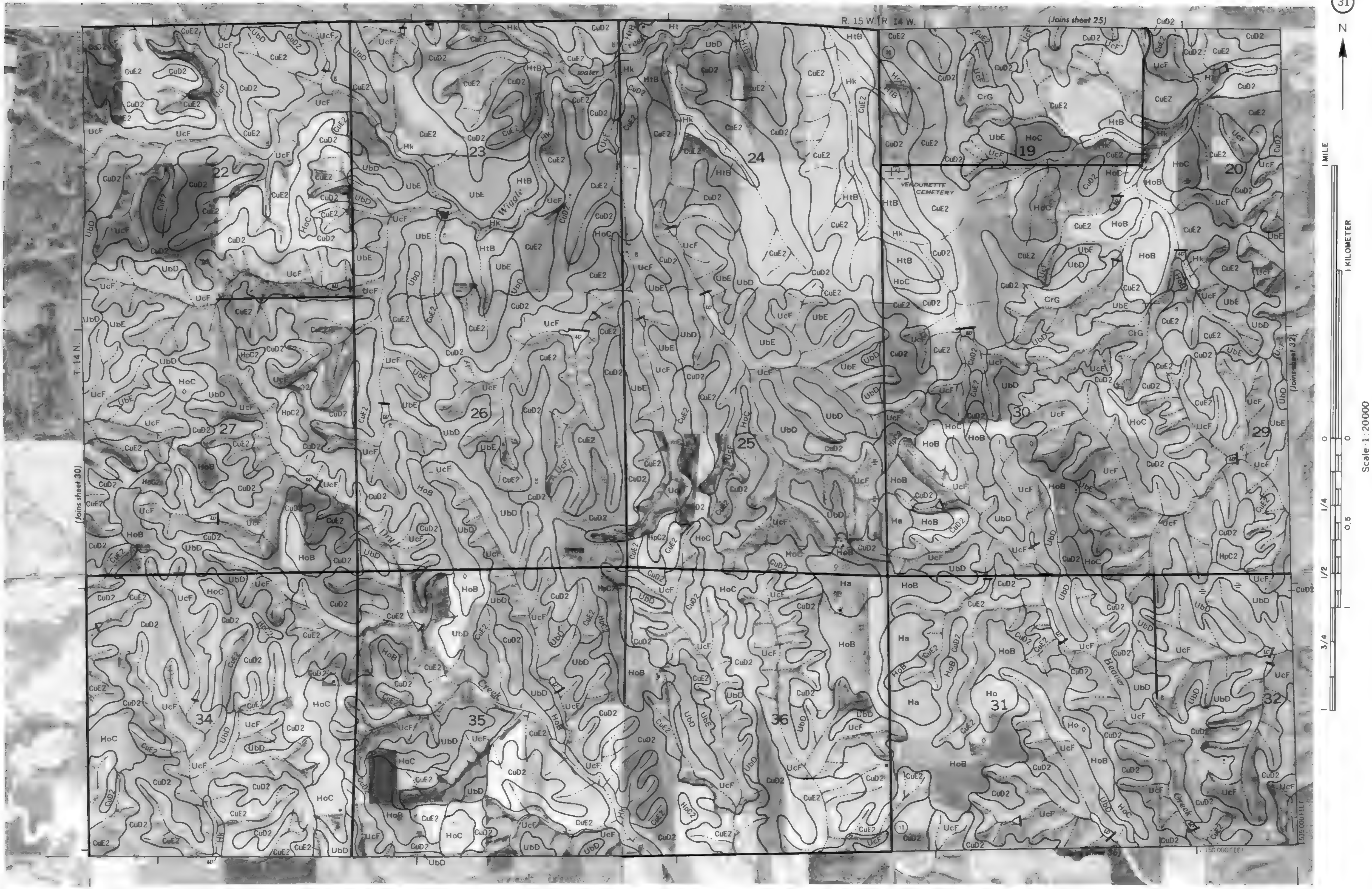
SHERMAN COUNTY, NEBRASKA NO. 29

This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



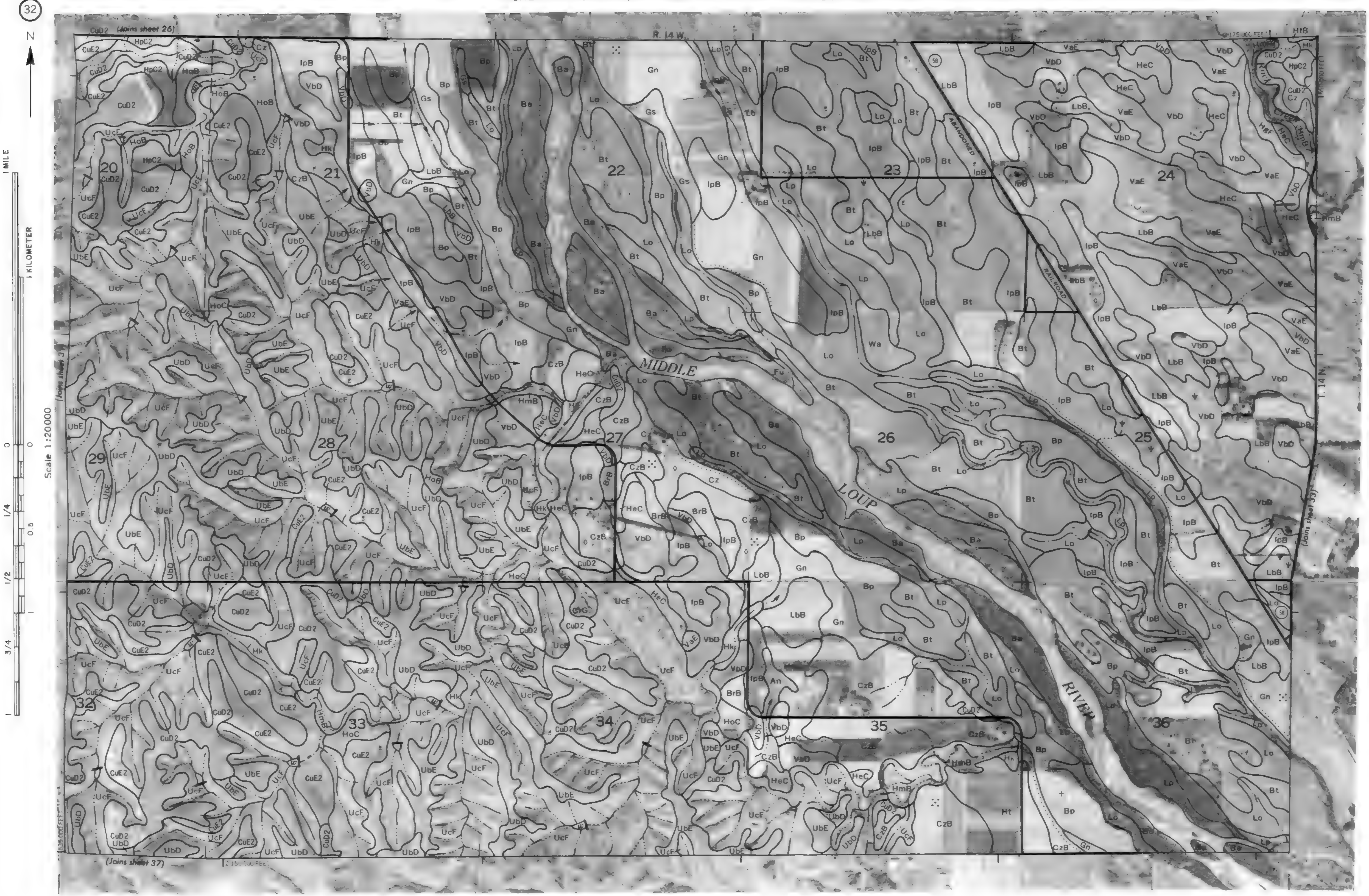
This map is compiled on 197[illegible] aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies
Coordinate grid ticks and land division corners, if shown, are approximately positioned

SHERMAN COUNTY, NEBRASKA NO. 30



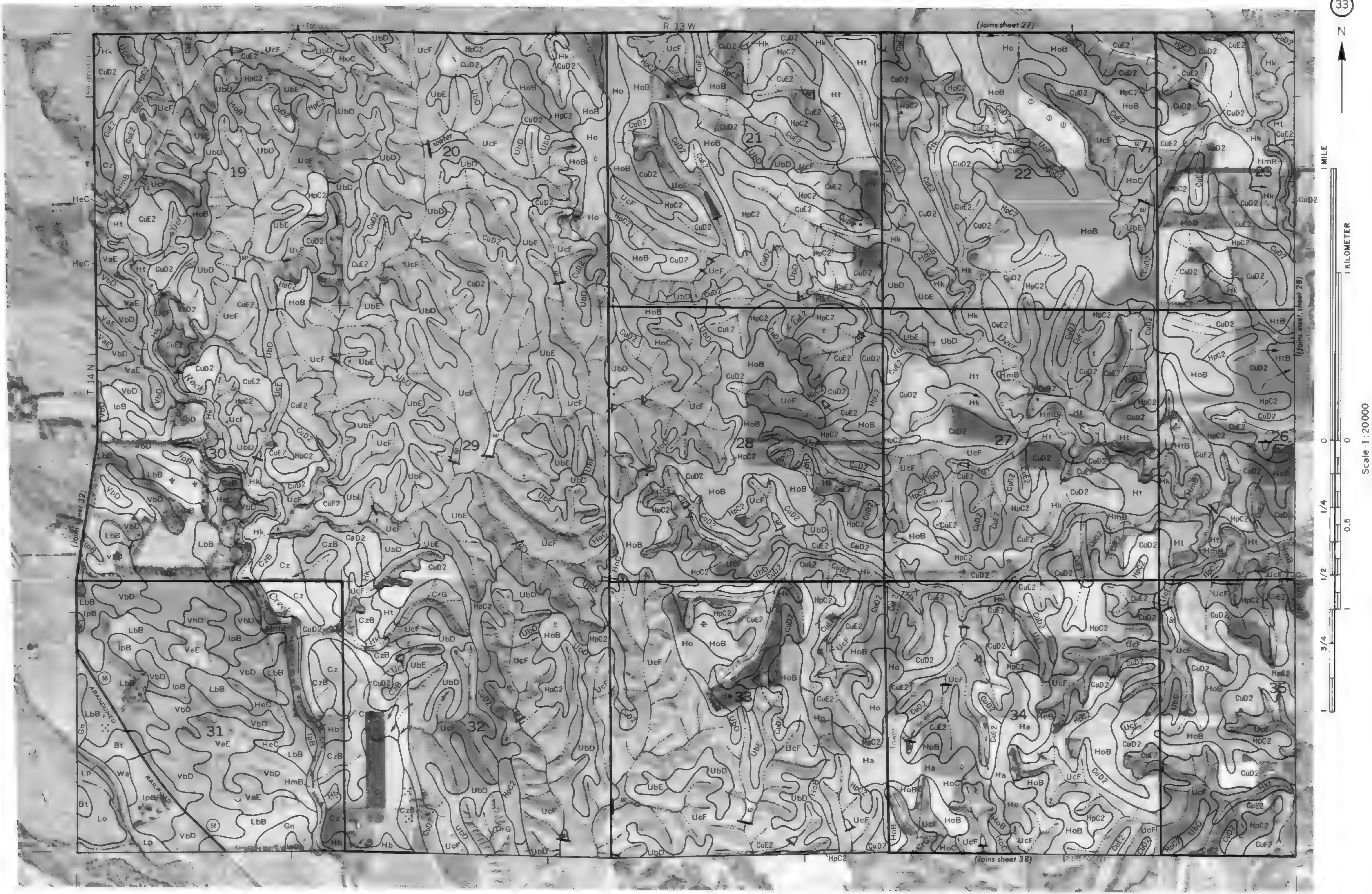
SHERMAN COUNTY, NEBRASKA NO. 31

This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



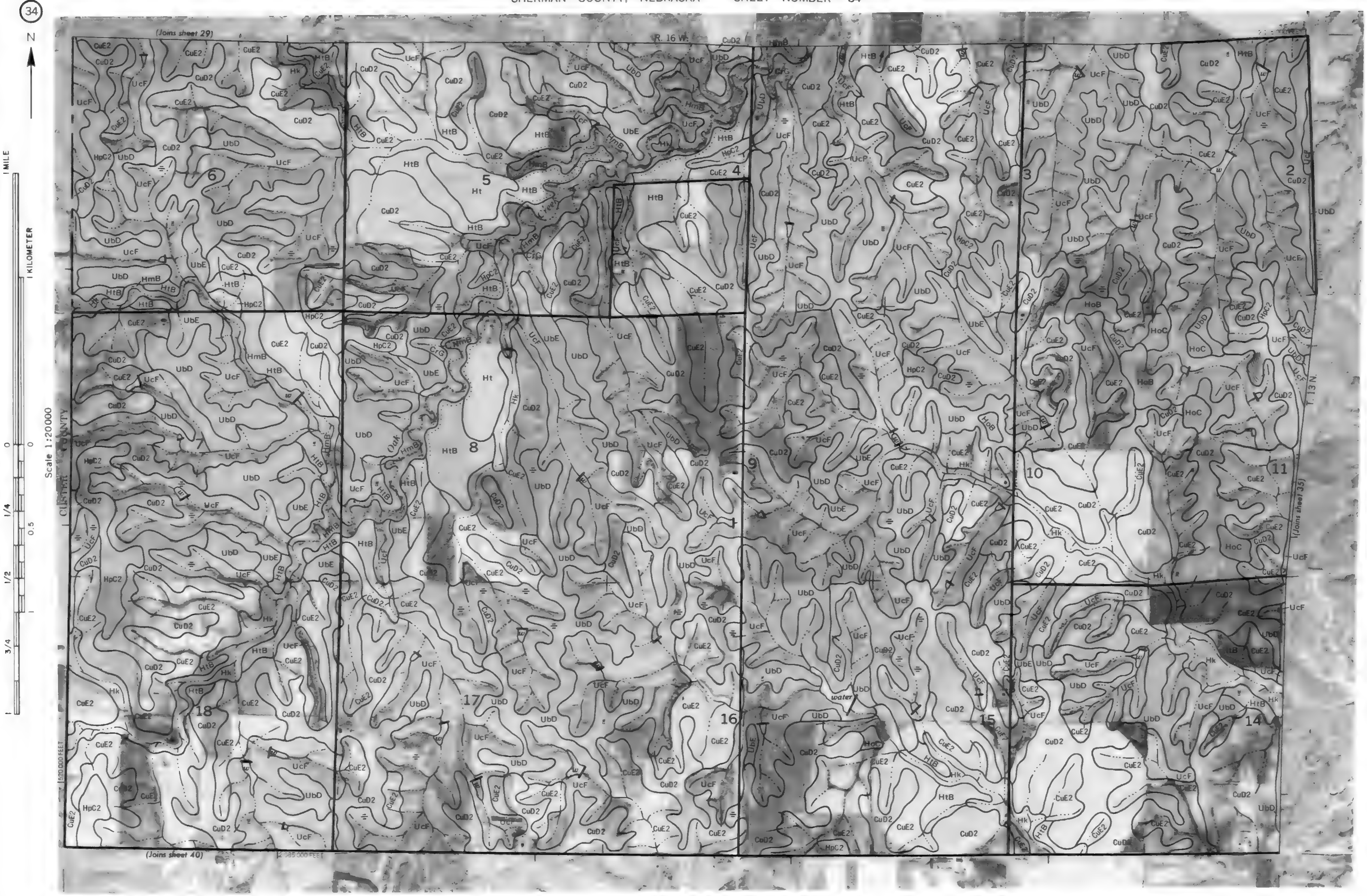
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 32



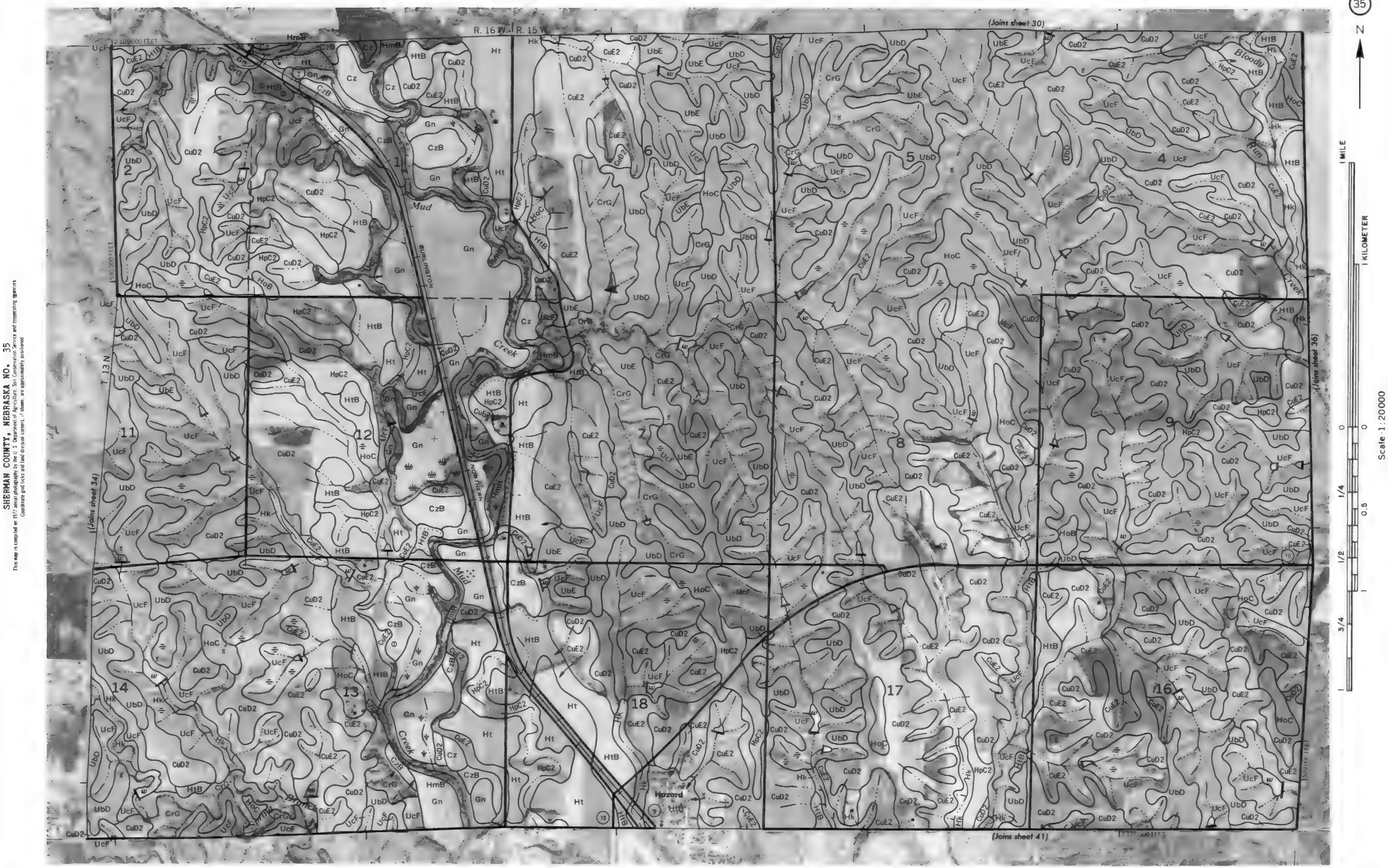
SHERMAN COUNTY, NEBRASKA NO. 33

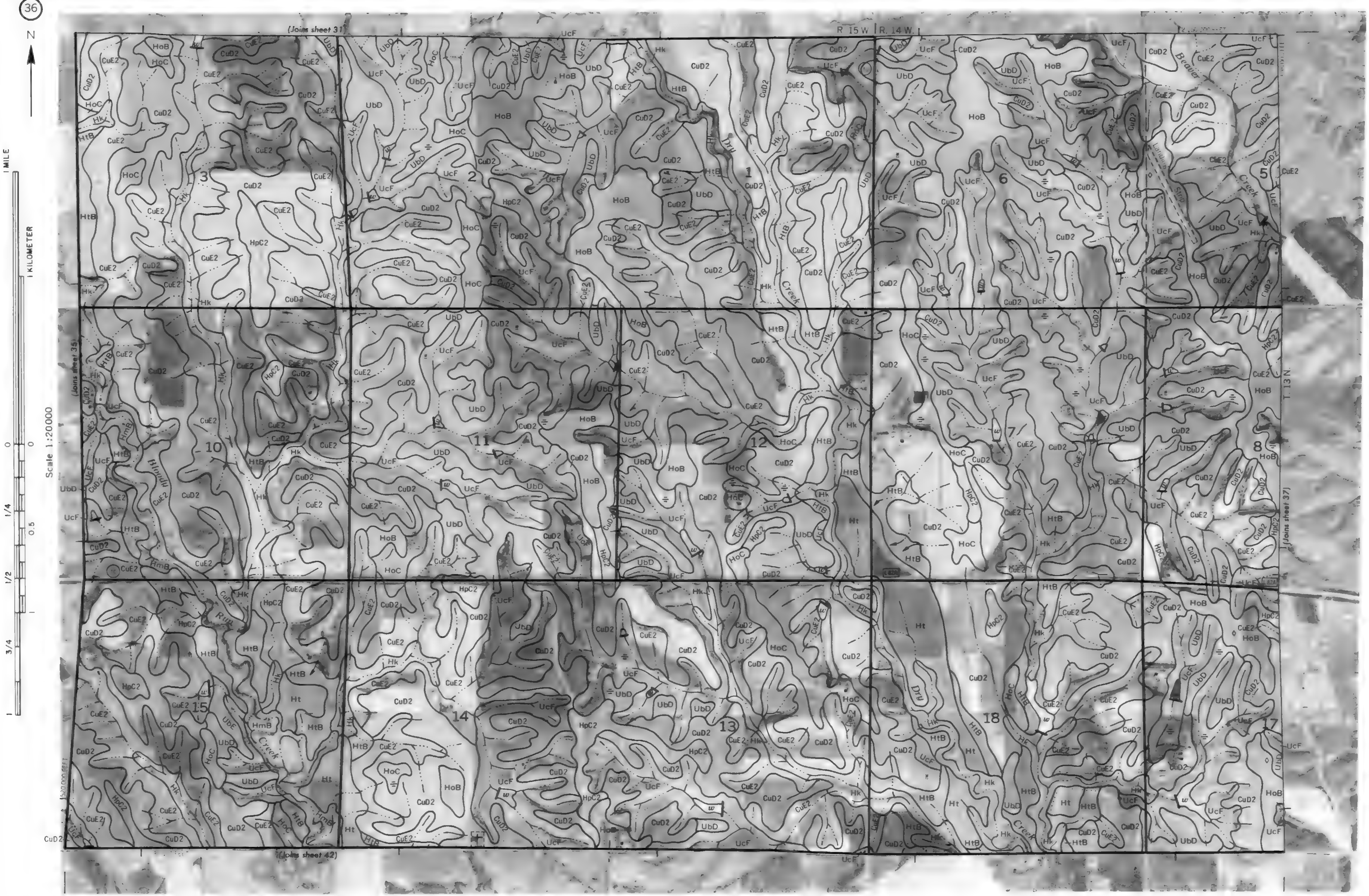
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 34


35
N
(Joins sheet 30)
(Joins sheet 34)
(Joins sheet 36)
(Joins sheet 41)
R. 16 W.
R. 15 W.
T. 13 N.
Mud Creek
Bloody Run Creek
BURLINGTON NORTHERN
Hazard
1 MILE
1 KILOMETER
Scale 1:20000
SHERMAN COUNTY, NEBRASKA NO. 35
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

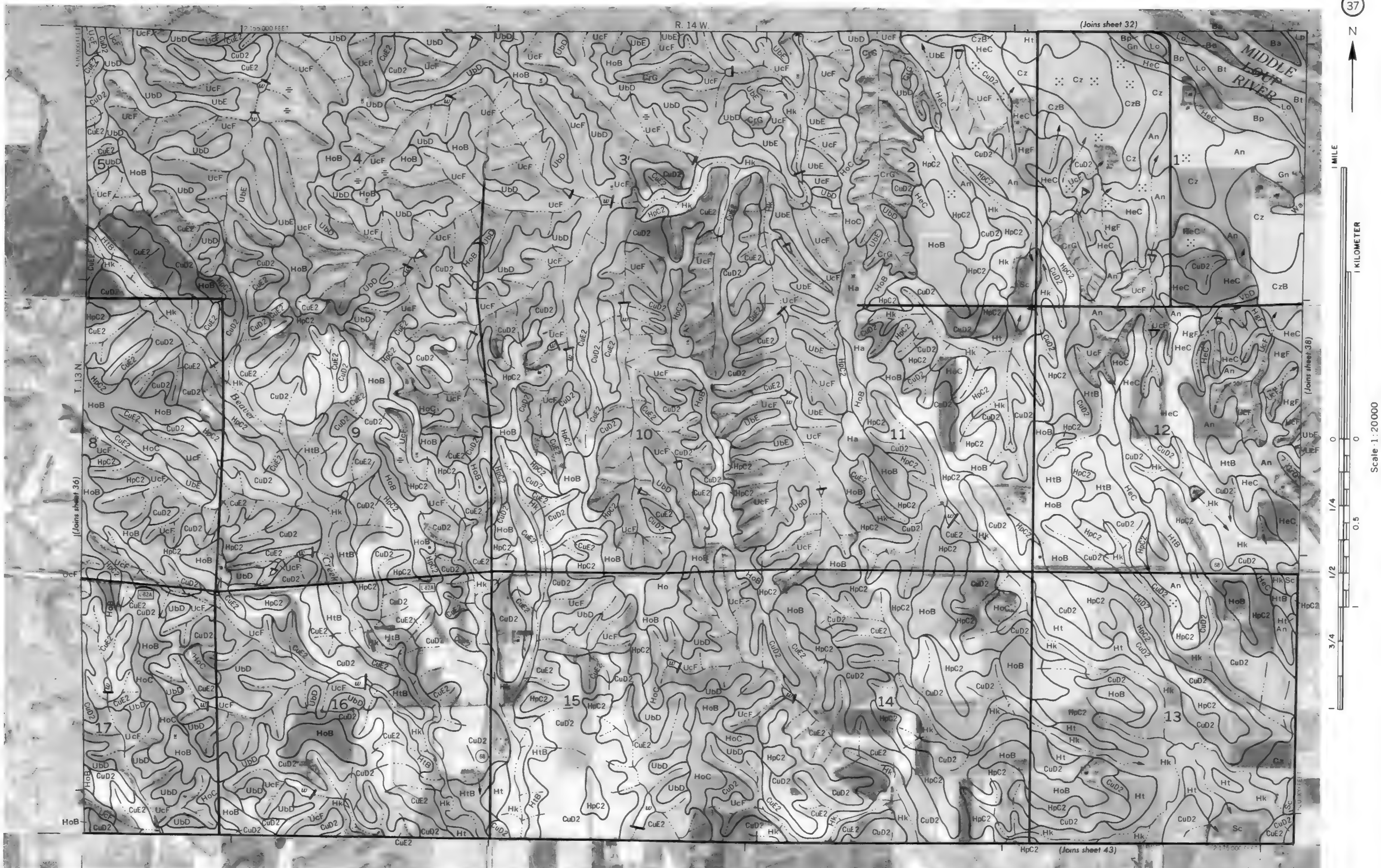


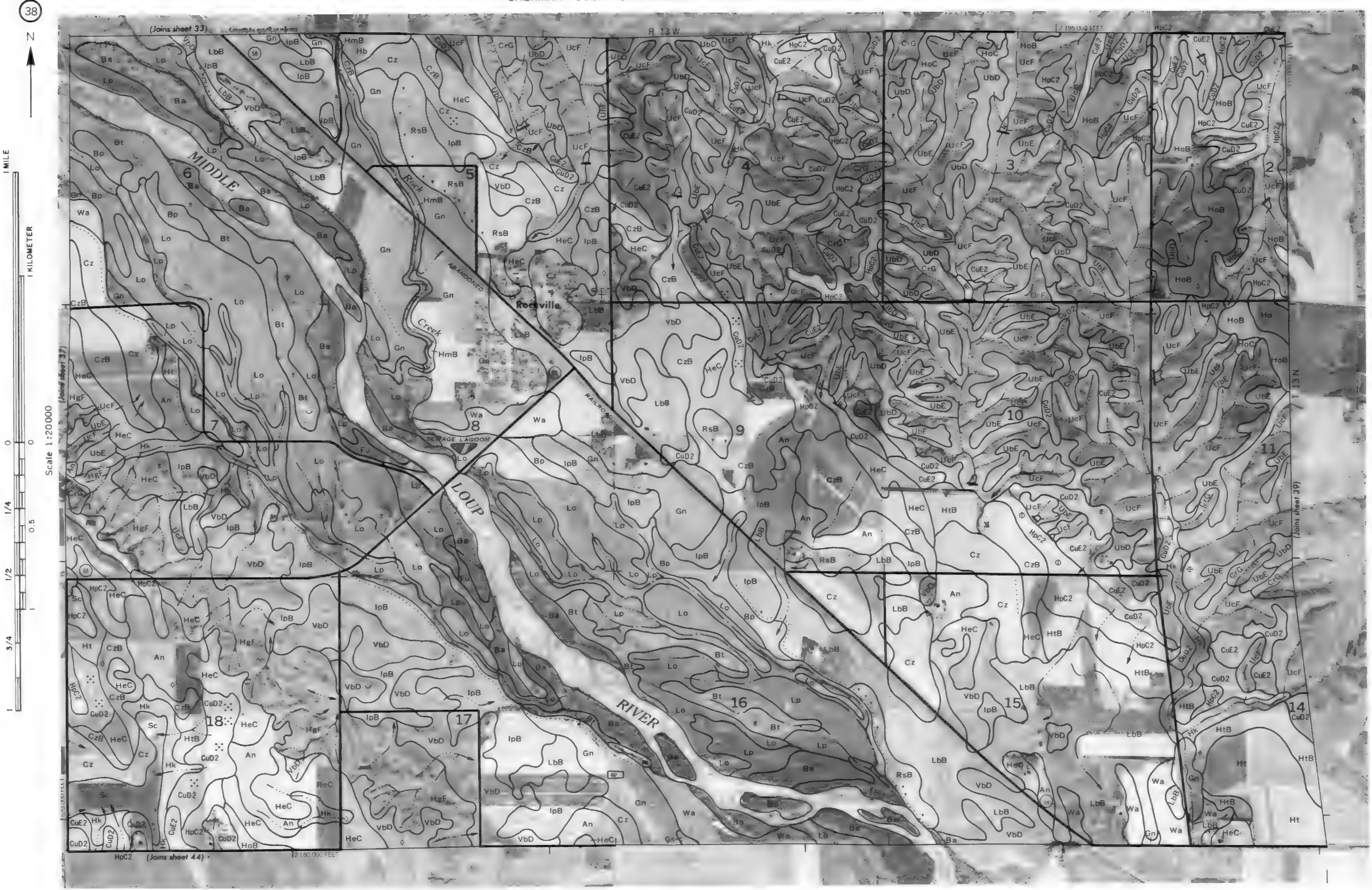
This map is compiled on 1971 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 36

SHERMAN COUNTY, NEBRASKA NO. 37

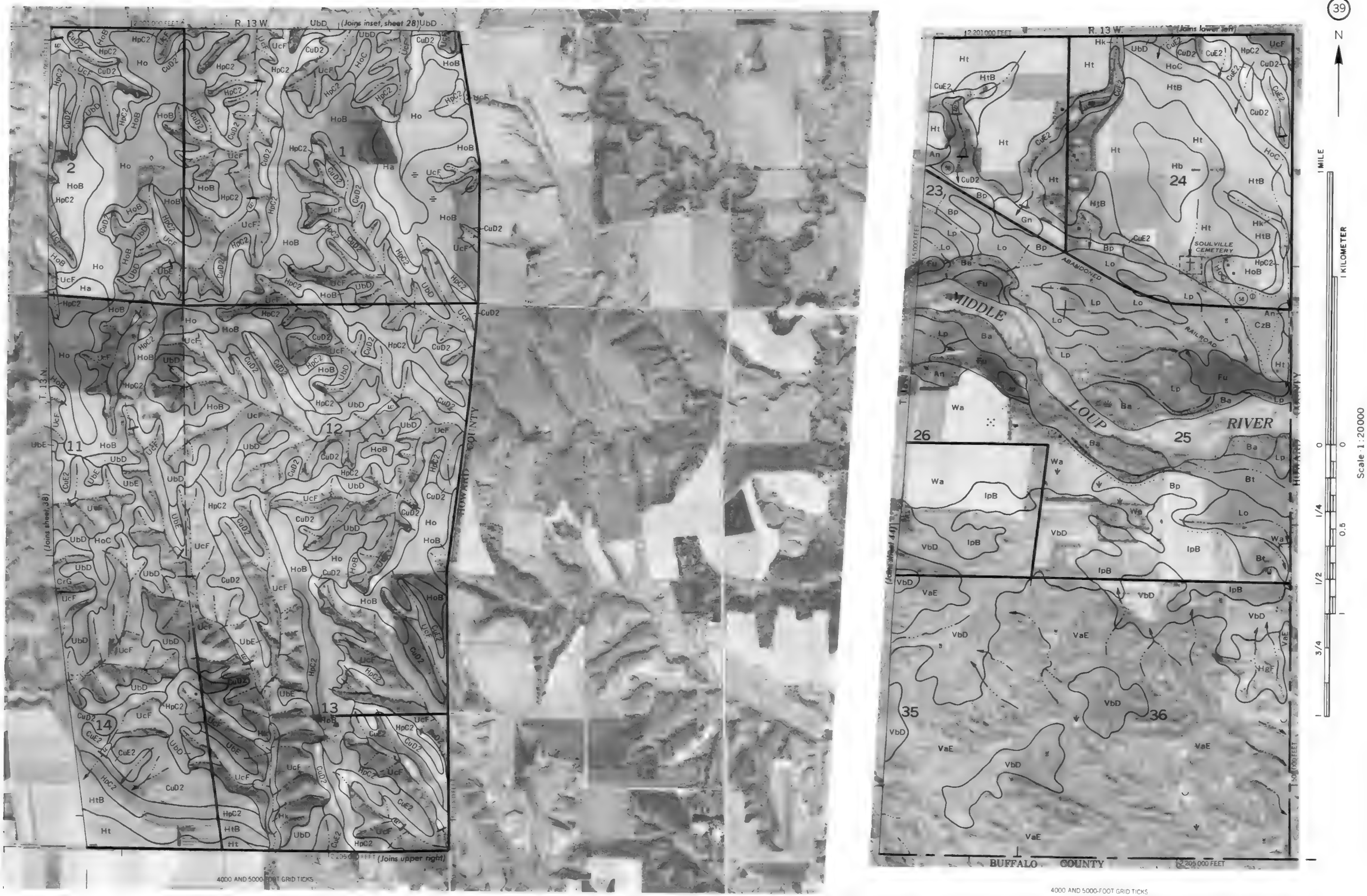
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





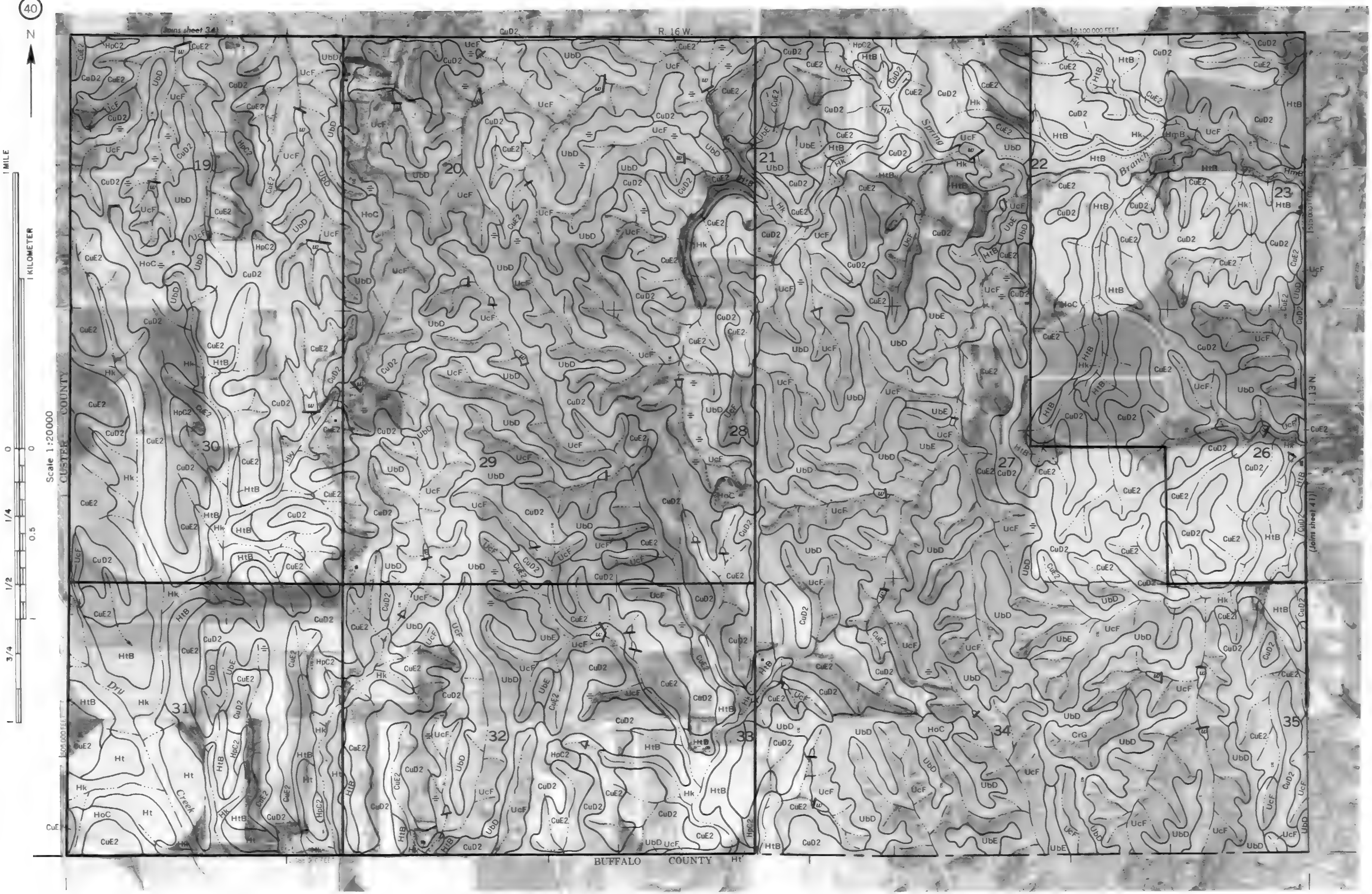
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 38



SHERMAN COUNTY, NEBRASKA NO. 39

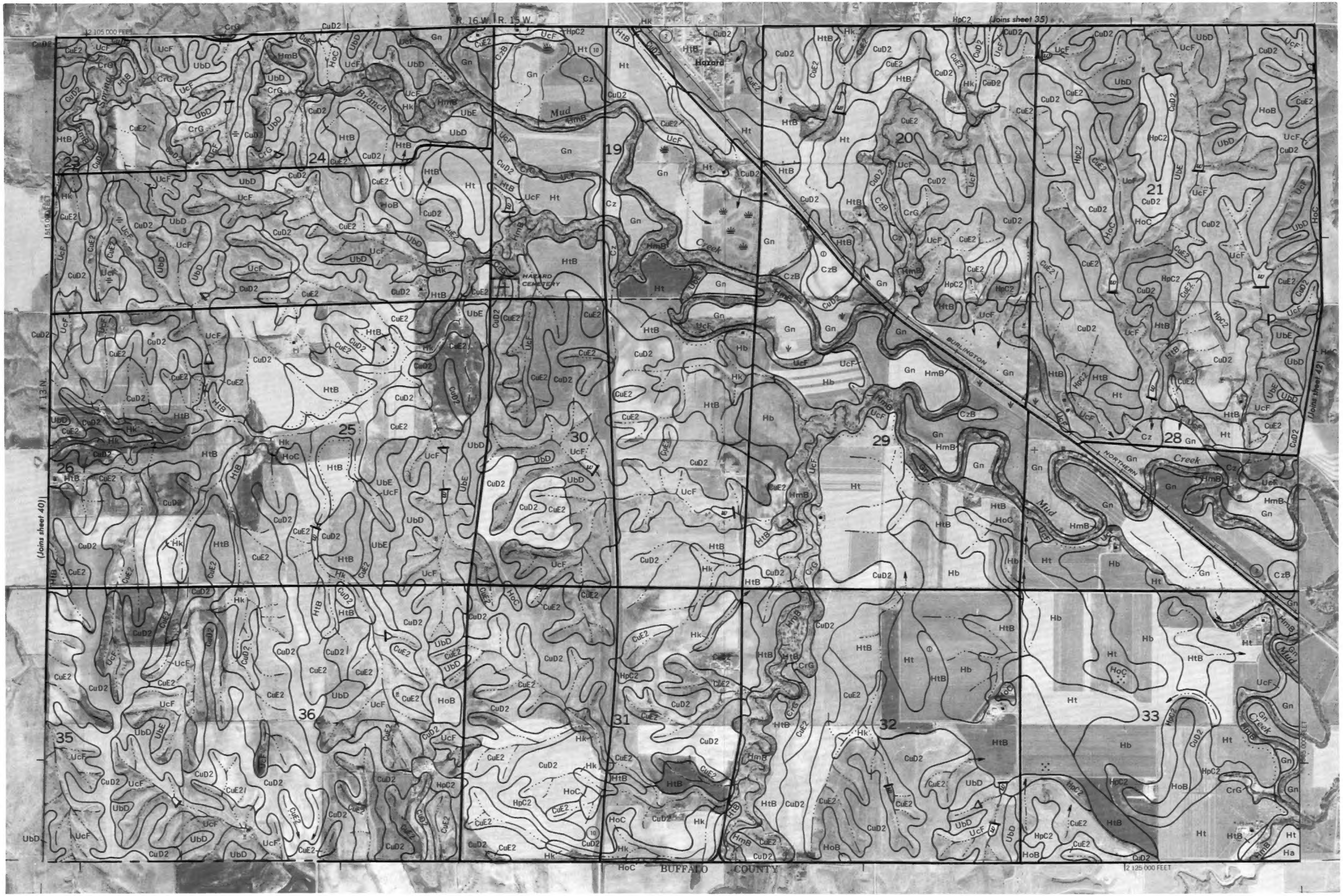
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 40

41



N

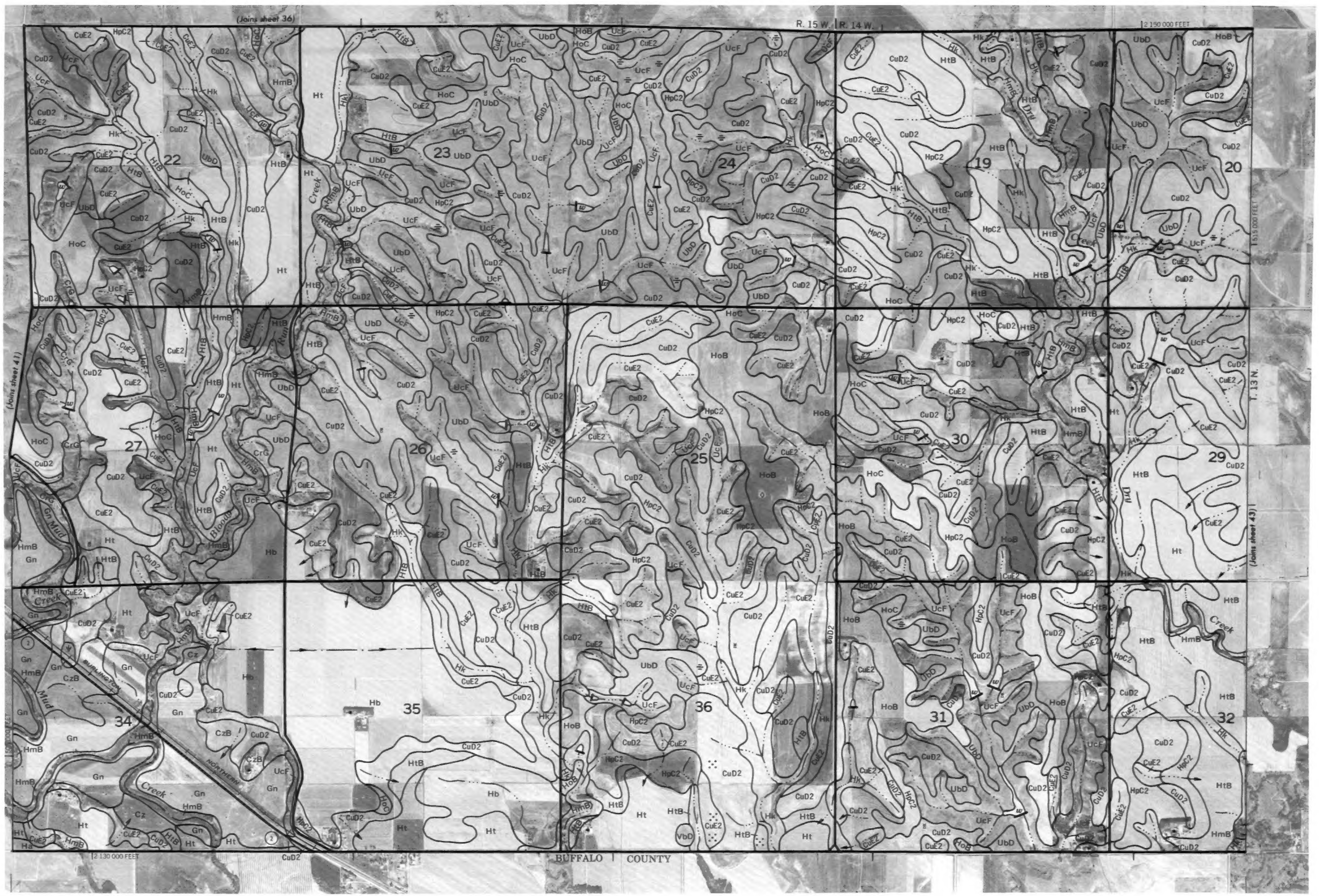
1 MILE

1 KILOMETER

Scale 1:20000

SHERMAN COUNTY, NEBRASKA NO. 41

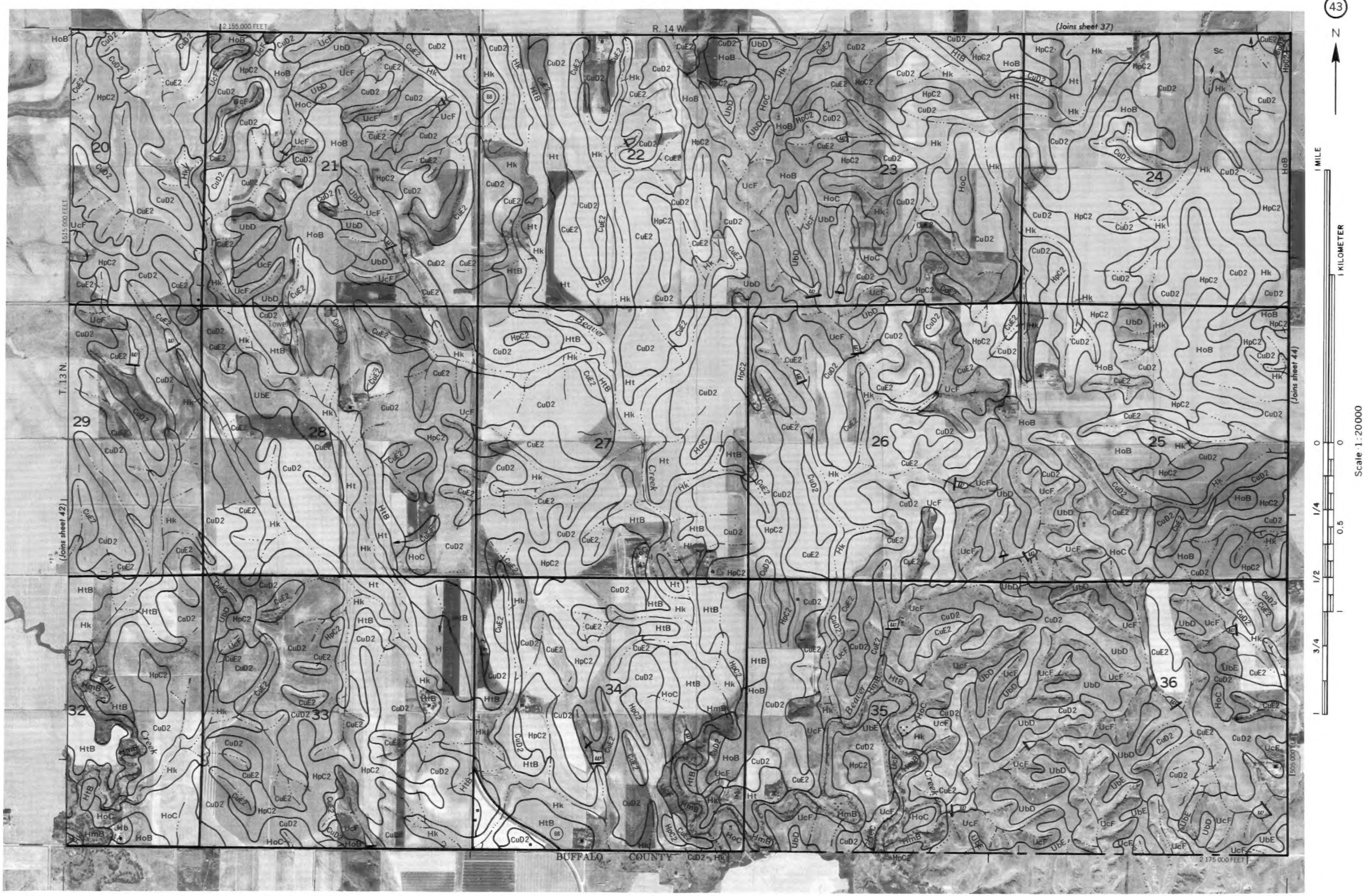
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

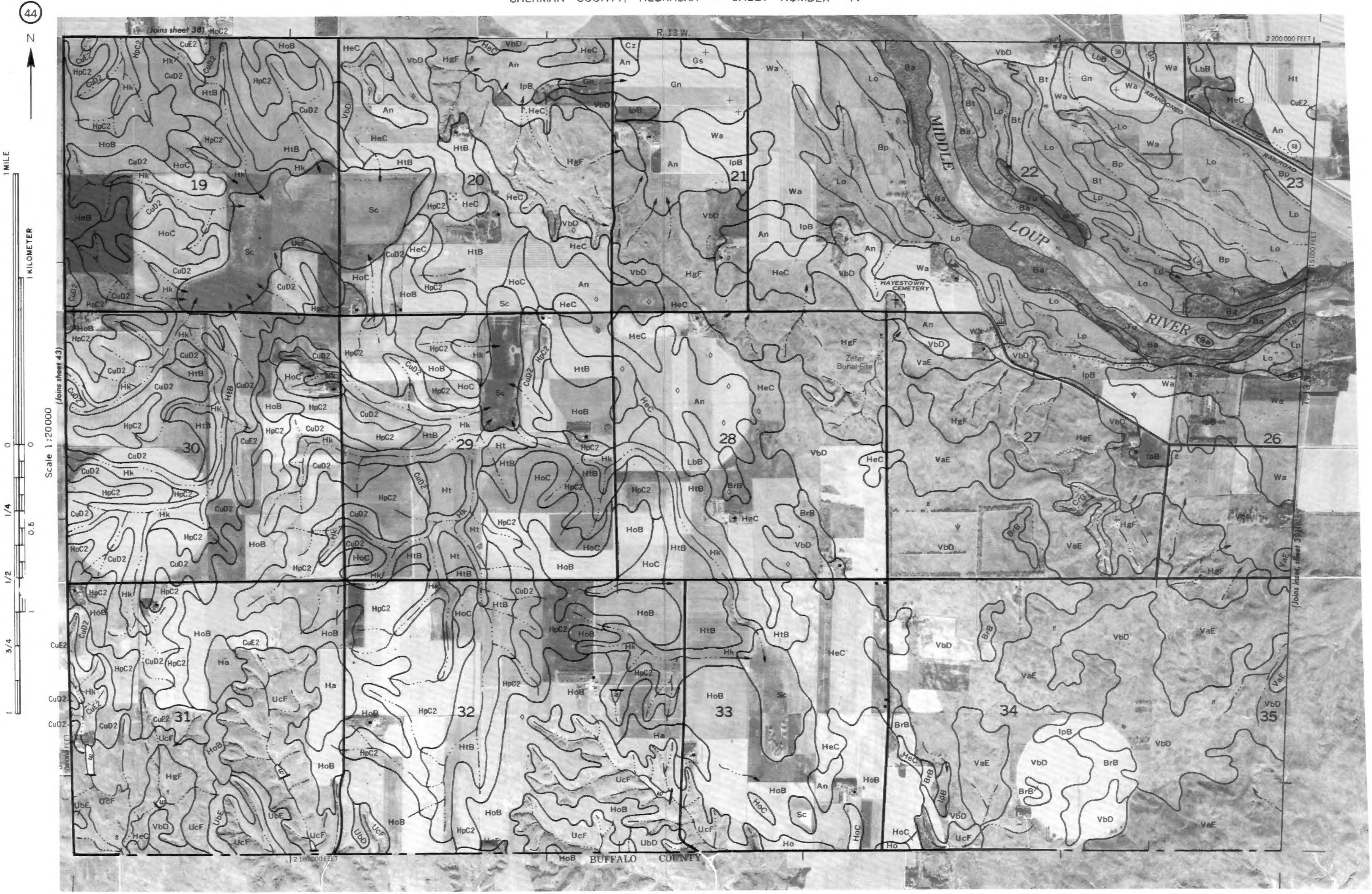


This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 42

SHERMAN COUNTY, NEBRASKA NO. 43
This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.





This map is compiled on 1977 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

SHERMAN COUNTY, NEBRASKA NO. 44